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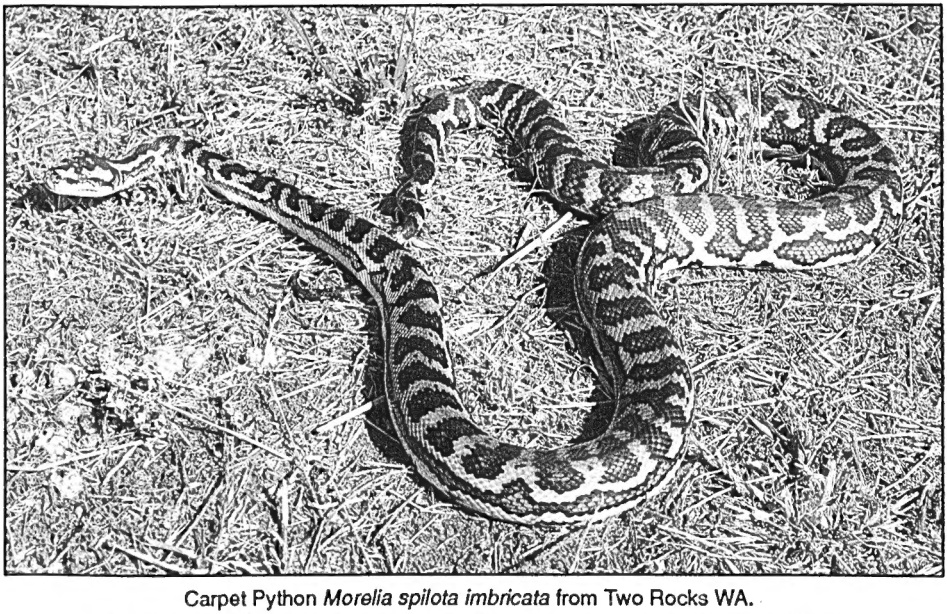
The Pitted-shelled Turtle *Carettochelys insculpta*. See paper on page15 (photo: C. Dorrian)



Carpet Python *Morelia spilota imbricata* from Two Rocks WA.
An example of the coastal plain morph. See paper on page 30 (photo: B. Bush)

Herpetofauna incorporates the *South Australian Herpetologist* and the *Bulletin of Herpetology* and is published twice yearly by the Australasian Affiliation of Herpetological Societies. The Affiliation started on an informal basis in 1974 and was formally established in 1977. It is the result of a formal agreement between member societies to participate in cooperative activities.

The Affiliation's objectives are to promote the scientific study of amphibians and reptiles and their conservation, to publish the journal *Herpetofauna,* to encourage liaison between member societies at the Regional level. It is not intended to be a separate society, nor is it to deplete member societies of their vital expertise and resources.
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SUPPORT FOR AMATEUR HERPETOLOGY BY THE SECOND WORLD CONGRESS OF HERPETOLOGY

Harald Ehmann, PO Box 9, Blackwood, SA

During the Second World Congress of Herpetology a number of herpetologists with a strong interest in amateur herpetology met several times to draft a resolution that addressed matters that are presently affecting amateur herpetology in an adverse way. A motion with essentially the same intent had been strongly debated and defeated at the First World Congress of Herpetology. A number of leading professional herpetologists also contributed to various stages of the draft of the recent resolution. This resolution was passed and is printed below in its final form as approved by the Secretariat of the World Congress of Herpetology.

RESOLUTION BY SECOND WORLD CONGRESS OF HERPETOLOGY

1. RECOGNISING that amateur herpetologists have contributed substantially to the body of fundamental knowledge which underlies herpetological research and further that they contribute to the knowledge needed to effectively manage and conserve wild populations of reptiles and amphibians, and

2. ACKNOWLEDGING that many herpetologists develop their interest and expertise with captive amphibians and reptiles,

3. AND further acknowledging that the collection of many species of reptiles and amphibians from the wild by amateur herpetologists, zookeepers and institutional herpetologists is a negligible factor in the decline of their populations, and

4. CONCERNED that many current conservation laws are ineffective for the conservation of biodiversity in that:

a) they are written for ease of enforcement
b) they seriously inhibit and restrict herpetologists from pursuing their responsible interests and from contributing to the body of information that is essential for the effective conservation of reptiles and amphibians.

THE SECOND WORLD CONGRESS OF HERPETOLOGY at its meeting in Adelaide, Australia, from 26 December 1993 to 6 January 1994:

1. Encourages continuing and wider amateur involvement in developing herpetological knowledge, and

2. Urges review of current legislation and its administration a) to ensure the effective conservation of the biota, and, b) to support contributions by amateurs to herpetology.

Moved: Harald Ehmann, Australia, Klaus Henle, Germany, Marcia Rybak, USA
Seconded: Chris Banks, Australia, Glenn Shea, Australia, Gerry Swan, Australia
Adopted: In favour 120+, Against 1, Abstentions 11.

This resolution deals primarily with amateur herpetology (in particular recognising its importance to the science). It also embraces the conservation and protection issues that have often been invoked by fauna authorities to suppress amateur herpetology. The resolution also further opens the possibility for amateur herpetology to contribute more effectively to conservation biology.

In Australia this resolution will hopefully have a significant ameliorating impact on the policies, legislation, and enforcement practices of fauna authorities that have been suppressive. Furthermore this resolution will provide support for amateur herpetology world wide. The movers, seconders, advisors and supporters commend the resolution to all herpetologists and fauna authorities. We hope this is a milestone in co-operation and we look forward to the advent of a new direction in herpetology the world over.

PROBLEMS WITH SUCCESSFUL DOUBLE CLUTCHING IN CAPTIVE GWARDARS, *PSEUDONAJA NUCHALIS* (SERPENTES, ELAPIDAE)

Brian Bush
9 Birch Place, Stoneville WA 6081

This paper was presented at the One Day Theme held on 29.12.1993 to coincide with the Second World Congress of Herpetology in Adelaide.

ABSTRACT

Pseudonaja nuchalis from the south-west of Western Australia show marked sexual dimorphism in size: females are much more slender than similar length males. Also there are obvious differences between the sexes in the behaviour of wild caught adults maintained in captivity: males are unintimidated and feed voraciously while females are very timid and feed sparingly.

This species may lay two clutches in a breeding season producing a second clutch 43-65 days after the first. Its small size and timidity are believed responsible for the lack of success experienced by this breeder in obtaining viable second clutches from wild caught adults. To date the only successful second clutch obtained is from a captive raised female collected as a hatchling. The eggs in all other second clutches recorded were not fully developed.

INTRODUCTION

There is considerable ambiguity surrounding the taxonomy of *Pseudonaja nuchalis* (see Mengden, 1985 and Bush, 1989 a & b), it may ultimately prove to be polymorphic, composite or both. Two or more species could be involved, with hybrids common within any population (Bush, 1989a). If *nuchalis* is composite then it is likely convergent interspecific polymorphism occurs, both within and between composite populations.

Ken Aplin (pers. comm.) of the Western Australian Museum is of the opinion that in the south-west there are at least two species involved, one being larger than the other. I have recorded the weight to length ratios of a sample of adult *P. nuchalis* from the south-west of Western Australia, and if Aplin's hypothesis is correct, it may include *P. nuchalis*, one or more composite species and possibly hybrids of these. However at this point this is of little significance from a husbandry perspective. The purpose of this paper is to document the problems I have encountered in keeping and breeding western brown snakes. The information presented here could well be applied to other *Pseudonaja* spp. also.

In captivity female *P. affinis* are similar in behaviour to *P. nuchalis*, although I have not recorded it double clutching, and *P. textilis* may double clutch (Shine, 1989).

Anyone experienced with *Pseudonaja* in Western Australia (pers. comm. with Paul Orange, Brad Maryan, Robert Browne-Cooper, Gayne Doyle and present study) all agree that in most instances female *P. nuchalis* can be identified from males on body shape and size.

Captive female *Pseudonaja* that I have kept *(affinis, nuchalis* and *textilis)* are also inclined to be much more fiery and nervous than males. I find this typical of many elapid species. Approach a cage when the female is out of the hide-box and she dances on her tail and strikes at you from behind the glass. Males are quick to settle down in captivity, females not so readily.

DOUBLE CLUTCHING WITH NON-VIABLE 2ND CLUTCH

To date I have successfully bred this species ten times. On five occasions a second clutch of eggs were deposited, however, in four the eggs were not viable. These "eggs" were small, yellowish and weighed between 1.3 and 4.92g, or less than half that of the eggs in the viable first-clutches. The second clutches were deposited 43, 45, 45, 50 and 65 days after the first.

A RECORD OF SUCCESSFUL DOUBLE CLUTCHING

A female collected as a hatchling from 20K south of Trayning, WA on 4 March 1989, in colouration what I would describe as a black and yellow banded morph with black head. Delineation of black on head and neck underwent an ontogenetic change from typical neonate to nuchal chevron, then to complete hood (as illustrated in Bush, 1989b pg 26: C1, A3, C3).
Mated on 28 February 1993 with "orange with black head" male.
Fed voraciously on mice (mean weight 22g) until 12 days prior to depositing 16 eggs on 2 May (63 days post mating).
The following day ate two mice, consuming in total 9 mice weighing 198g prior to depositing second clutch.
Final feed on 5 June, 11 days before depositing 13 eggs on 16 June, 45 days after the first clutch.
Eggs from both clutches successfully incubated at 28°C.
First clutch hatching after 65-67 days, second after 85-91 days. Second clutch larger than first (mean 7.97g v. 8.36g). A summary of data appears in Table 1.

Table 1 Data on eggs and neonates for both clutches of a successful double clutching in *Pseudonaja nuchalis.*

1st CLUTCH 2-5-93				2nd CLUTCH 16-6-93			
1 *	35mm x	17mm x	6.06mm	1	42mm x	16mm x	8.15mm
2	33	12	3.46	2	35	19	8.76
3	28	15	3.48	3	36	19	8.91
4 *	32	20	7.51	4	34	20	8.57
5 *	31	20	7.75	5	33	17	7.26
6	21	17	3.50	6	32	18	7.46
7 *	40	20	9.18	7	33	20	8.70
8 *	36	20	8.78	8	33	21	8.30
9 *	32	20	8.03	9	35	21	9.05
10	26	16	3.87	10	40	17	9.13
11 *	31	20	8.38	11	34	21	8.57
12 *	32	21	8.63	12	32	20	7.82
13	27	18	4.07	13	33	19	8.06
14 *	33	19	7.33				
15	28	15	3.58				
16	28	17	4.92				
Mean for 9 eggs*	33.6	19.7	7.97	Mean	34.8	19.1	8.36
Female Reprod. Effort 51.3% (if all fully developed 66.4%) Hatched 7-9 July 93 (65-67 days) Neonate weight (gm) 4.96-5.24 (mean 5.14) Postnatal slough 26-29 July (19-20 days)				Female Reprod. Effort 56.64% Hatched 9-15 Sept 93 (85-91 days) Neonate weight (gm) 4.52-5.41 (mean 4.97) Postnatal slough 19-24 Sept 93 (9-10 days)			

None of the neonates had bands. All can be placed to either Mengden's (1985) "orange with black head" morph or "pale head, grey nape" morph with nuchal chevron.

An egg from the second clutch that failed after 67 days incubation was opened and revealed two dead embryos. They both had the typical neonatal head markings and extremely short bodies. It is not uncommon for twins to successfully hatch from one egg. However in this case, I do not believe they would have had sufficient room to fully develop.

DISCUSSION

Figure 1 is a graph comparing male and female weight to length ratios. Sample sizes are small (13 male , 7 female + 2 gravid and 1 post-parturition) and from a limited area in the south of Western Australia. Both sexes obtain equivalent ratios when their SVL is 95cm or less. This may be because females at this length have not commenced reproduction, or males are sexually inactive. Shine (1989: 197) lists mean adult SVL's for both sexes in each morph. I have included his data for the morphs and recalculated the mean SVL's: males = 93.4 v. 107.5cm in present study, females = 87.5 v. 97cm. From this one would assume that males and females between 80-95cm would be reproductively active. Shine mentions a south to north clinal reduction in size, at least in the "southern morph". My data is for *P. nuchalis* from the south where they are larger, and the measurements include live and fresh roadkilled snakes, whereas Shine examined pickled specimens which may have shrunk over the years. Gravid females attain equivalent ratios to males and non-gravid females in excess of 95cm have lower ratios. As can be seen by the graph, the males really put on the "middle-age spread"! I have noticed when handling live males they definitely appear to be stronger than females. Maybe in females, muscle is sacrificed to make way for fat bodies and the development of eggs, whereas the muscular body in males has evolved as a response to male/male combat.

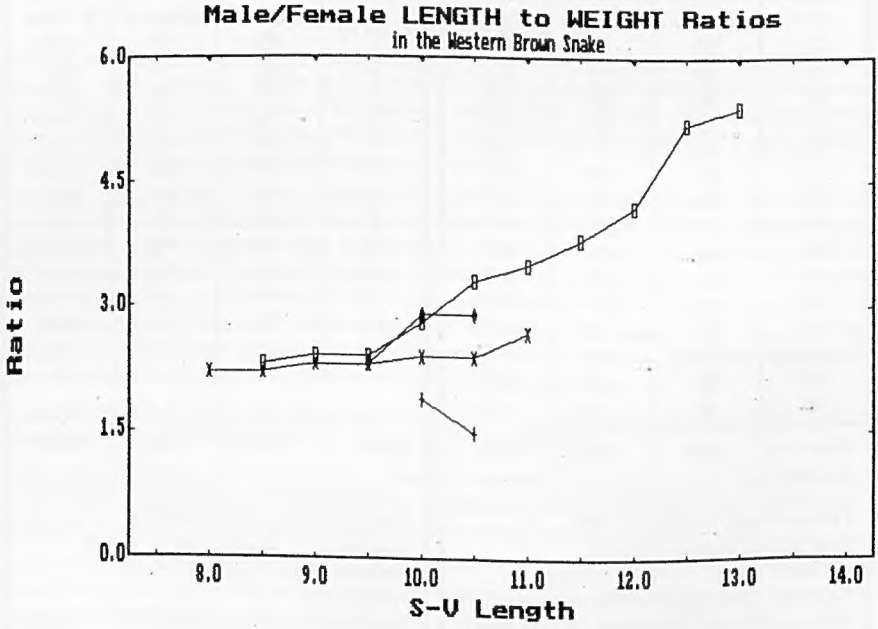

Figure 1. Graph comparing weight to length ratios of male (o) and female (x) Western Brown Snakes *(Pseudonaja nuchalis)*. Note comparable ratios in both sexes up to 95cm snout-vent length (SVL), after which males become much heavier than similar length females.
Post parturition (+) and gravid (♦) females are included also. Above SVL's of 95cm it is only a gravid female's increased weight which brings her in line with similar length males.

The females that were "unsuccessful" in the second clutches were all collected from the wild as adult snakes, and were of very nervous temperament. They were timid in feeding behaviour and reluctant to take freshly thawed mice. This may have resulted in a lack of nutrients required to sustain the oviducal eggs to complete development. In the first clutch there is an investment of 50-60% of the female's body-weight, which can cause a reduction in a female's weight to 152g in a 102cm SVL snake. In the short time interval in which the second clutch has to develop, the energy intake to produce this clutch has to be both rapid and large. The small body-size observed in female *P. nuchalis* (Fig. 1) does not allow the storage of sufficient nutrients to sustain successful development of more than a single clutch in a season. In some cases females fed until 10-15 days prior to depositing the first clutch. Once this has occurred, all energy reserves are exhausted. The female that laid the successful second clutch was exceptional in that it fed the day after the first clutch was laid and continued feeding until 198g total weight of mice had been consumed. I believe a gravid female's metabolism is higher than non-gravid females and males, estimated by how quickly the mouse-lumps in her body disappeared and the increase in rate of defecation. The second clutch weighed 108.74g, or a reproductive effort (RE) of 56.6% of her body-weight, which when combined with the first clutch (RE 51.3%), equalled 108% of her body-weight in offspring in one season.

It would appear the best stock for a breeding program for *Pseudonaja nuchalis*, in fact all *Pseudonaja* spp., are females bred, or at least raised in captivity. Another problem I experience with this species is the inability to breed an individual female more than two consecutive years in a row, the snake usually dies within 6 months of depositing the final clutch in the second year. It appears they are unable to recoup sufficient energy after the second reproductive effort. Feeding and vitamin supplements do not help as the animal does not appear to absorb anything from the food and weight loss continues to the point where it is nothing more than skin and bones. If this is a response related to change of environment after capture, it hopefully may not occur in captive raised individuals.

REFERENCES

Bush, B. 1989a. Polymorphism in captive bred siblings of the snake, *Pseudonaja nuchalis*. Herpetofauna 19 (20): 28-32.

Bush, B. 1989b. Ontogenetic colour change in the Gwardar, *Pseudonaja nuchalis*. West. Aust. Nat. 18 (2): 25-29.

Mengden, G.A. 1985. A chromosomal and electrophoretic analysis of the genus *Pseudonaja*. In The Biology of Australasian Frogs and Reptiles (Eds. G. Grigg, R. Shine & H. Ehmann), pp. 193-208. Surrey Beatty & Sons, Sydney.

Shine, R. 1989. Constraints, allometry and adaptation: food habits and reproductive biology of Australian Brownsnakes (*Pseudonaja:* Elapidae). *Herpetologica* 45 (2): 195-207.

AMATEUR HERPETOLOGY IN AUSTRALASIA: ITS HISTORY, ROLES, STATUS, PROBLEMS AND FUTURE.

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This paper was presented at the Second World Congress of Herpetology in Adelaide from 29.12.1993 to 6.1.1994.

HISTORY

Like most natural sciences in Australasia herpetology has very significant amateur origins. This is quite evident in the early writings of Gerrard Krefft, probably Australia's first herpetologist, who in the 1860's involved a significant number of volunteers in his immediate social circle (and also members of the public) who had a keen interest in natural history to collect specimens around Sydney (Krefft 1869). Cogger (1985, 1993) summarised the activities of some of Australia's early herpetologists, many of whom were aided by amateur herpetologists. Schomburgk in the 1850's and 60's had a network of amateur naturalists who supplied material, some of which found its way into the museums of Europe. In earlier days, prior to the development of anti-venoms for snake bite there were many people who worked by exhibiting snakes at shows and carnivals, practicing dare-devil side-show type activities and very often selling patent antidotes, some of which were severe poisons in themselves. These are well documented by Cann (1986). These people (while they did make a living from these activities) were nonetheless amateur herpetologists, in that they contributed many specimens, opportunities and observations, particularly at the time to museum and university researchers who were interested in Australian herpetology. McCoy in Victoria gathered much material and information in this way as did Spencer some time later, particularly during and consequent to the Horn Expedition to Central Australia (e.g. Paddy Byrne of Charlotte Waters Telegraph Station sent him numerous natural history specimens including the type specimen of the Bronzeback Legless Lizard *Ophidiocephalus taeniatus*). Glauert of Western Australia also relied heavily on amateur providers of specimens and data.

Unfortunately the history and contributions of earlier Australasian amateur herpetology are not well documented. Some of it can be gleaned: names in particular (often in museum registers and acknowledgements), sometimes snippets of their activities in popular magazines and newspaper accounts, and on other occasions, their own publications. Banks (1982), reviewed herpetology in Australia and highlighted some of its essential characteristics at that time, some of which are now changing. One of the past characteristics has been its relative informality and the ease with which information flowed between the various elements.

In the past 20 or 30 years, there have been many amateur herpetologists (some of whom have since entered the professional ranks) who contributed to the data base of the Australasian herpetofauna. These include in the Solomon Islands Mike McCoy, in Papua New Guinea, Fred Parker, in New Zealand, Ivan Borich, Rod Rowlands, Richard Sharrell, Bruce Thomas, Peter and John West, ; in Australia, Marion Anstis, Graham Armstrong, Jeff Banks, John Barker, Brian Barnett, Greg Barron, Gary Beardsell, Gavin Bedford, Dirk Von Behrens, John Bevan, Norm Boyd, Terry Boylan, Joe Bredl, Arthur Brook, Peter Brown, Kevin Budden, Brian Bush, George Cann Snr, George Cann Jnr, John Cann, Michael Cermak, Andy Chapman, Neil Charles, Harold Cogger, Robert Cook, Geoff Coombe, Graham Cooper, Steve Copland, Chris Corben, John Cornish, Athol Crompton, Greg Czechura, Garry Daly, Keith Davey, John Dell, Andrew Dennis, Chris Dorrian, Malcolm Douglas, John Dwyer, Hans Van Dyk, Jim Edwards, John Edwards, Harald Ehmann, Paul Fennell, Ray Field, Albert Fischer, Mark Fitzgerald, John Fowler, Harry Frauca, Jim Frazier, Charles Frost, Greg Fyfe, Rodney George, Pavel German,

Mike Gillam, John Goode, Graeme Gow, Paul Griffin, Ken Griffiths, Reg and Brian and Denise Hancock, Steve Haniford,Mark Hanlon, Peter Harlow, Greg Harold, Chris Harvey, Tim Hawkes, Fred Hersey, Rusty Holmes, Paul Horner, Ray Hoser, Peter Hudson, Bob Humphreys, Grant Husband, Bill Ingall, Bill Irvine, Hank Jenkins, Greg Johnston, Peter Jones, Glen Laycock, Colin Limpus, David Knowles, Daryl Levi, Rick Longmore, Tim Low, Roy Mackay, Sir William Macleay, Alan Manning, Keith Martin, Brad Maryan, John McLoughlin, Bill McReaddie, William Meikle, Dean Metcalfe, Greg Miles,David Millar, Bob Miller, Brian Miller, Hans Mincham, Peter Mirtschin, John Mitchell, Ian Morris, Bruce Mules, Bruce Munday, Rick Nattrass, Lyall Naylor, Jan Nedved, Ian Norton, Harold Nygren, Will Osborne, Roy Pails, Uwe Peters, Magnus Peterson, Chris Pollitt, Peter Rankin, Peter Rawlinson, John Read, Peter Richardson, L. Robichaux, A Rose, Ross Sadlier, Gunther Schmida, Barry Searle, Glenn Shea, Rick Shine,Ken Slater, Anthony Sokal, Andrew Spiers, David Stammer, Paul Swaitkowski, Gerry Swan, Mike Swan, Steve Swanson, Charles Tanner, Mike Thompson, Peter Tight, Mike Trenerry, Kingsley Turner, Mike Tyler, Mike Van Der Stratten, Mel Ward, Arthur Watts, Gary Webb, Grahame Webb, Paul Webber, John Weigel, Richard Wells, Ross Wellington, Eric West, Pat Whittaker, Arthur White, George White,Dick Whitford, Mark Wilson, Steve Wilson, Julian White, Geoff Witten, John Womb́y, Eric Worrell, Dan Wotherspoon.

This list of amateur contributors is by no means exhaustive: it includes only those names I know of who were active in various substantial amateur herpetological studies for at least five years and who furthermore were active prior to 1988. I'm sure there are many I've missed and I apologise for that. And there are of course many others who have become active since 1988. I have included the names of professional herpetologists only if I definitely know of their amateur activities.

This very substantial amateur input, particularly in the last 30 to 40 years has been possible due to the relative economic affluence of the Australasian region. Perhaps not so much in Papua New Guinea, but certainly in Australia and New Zealand there is a significant number of people with adequate resources to spend time studying reptiles and frogs simply because they enjoy doing it (the true amateur) and without, in most cases, receiving any remuneration. Many of the photographers of reptiles and frogs who have contributed substantially to recent Australasian herpetological publications are in fact amateur herpetologists. Two other factors have contributed substantially to this involvement at the amateur level in the Region. These are 1) the high herpetofaunal diversity, about 1,100 species of reptile and 400 species of frog and 2) there was almost no legislative restriction on amateur activity until about 15-20 years ago. This started to change 20 or so years ago and is changing even more now with the advent of animal welfare legislation.

ROLES

Amateur herpetology has been a training ground and source of recruitment into professional areas. The current professional and institutional herpetologists and authors in Australia include a significant and highly productive number who have their origins in amateur herpetology. The names are familiar, Chris Banks, John Barker, John Cann, Harold Cogger, Harald Ehmann, John Goode, Paul Horner, Rick Shine, Colin Limpus, David Knowles, Gerry Marantelli, Mike McCoy, Peter Mirtschin, Fred Parker, Martyn Robinson, Richard Sharrell, Mike Tyler, Gunther Schmida, Glenn Shea, Gerry Swan, Grahame Webb, John Weigel, Steve Wilson. These herpetologists have between them contributed the major share of the last decade's herpetological books. Many other herpetologists from amateur ranks became involved or are now involved in professional activities such as research, biological survey, education and zoo work.

About 70% of the amateur (or former amateur) herpetologists named in this paper have published information resulting from their own work. This output is often the major part of our knowledge of the natural history of many Australasian reptiles and frogs. Shea (1994) has

reviewed amateur contributions to herpetofaunal field work in Australia and he identified two vital factors that have allowed amateur contributions. These are 1) the availability of *Herpetofauna* and various field naturalist journals as publishing vehicles for observations and 2) encouragement by professional herpetologists of some amateurs to make observations and assist in research programs.

It must be pointed out that *Herpetofauna* is a journal that is funded and published by Australian and New Zealand amateur herpetological societies, it is primarily for their members and editorial policy has always been that contributions by amateurs have priority. Furthermore *Herpetofauna* has a user-friendly editorial process: the review, preparation and rewriting (if necessary) of articles and notes for publication by amateurs often involves far more editorial work than other journals would ever consider. Yet with supportive reviewers those amateur herpetologists who want to write are given that all important help and encouragement to develop proficiency in reporting their observations.

Australasian amateur herpetology has funded and published this, the only regional journal devoted to herpetology, for over twenty years at the same time providing amateur herpetologists with help to develop themselves and the science. Many amateur herpetologists are considerably handicapped in publishing by one or more of these factors: the widely held erroneous belief that "I'm not good enough to write", not having the personal support of an experienced or qualified herpetologist, the fear of being harshly treated by overzealous fauna enforcement officers for trivial and often inconsequential transgressions of the beaurocratic reptile and frog protection laws and regulations, and the limited time that they can devote to writing after their other day-to-day responsibilities are met.

Australasian amateur herpetology has also played an important role in public education, environmental awareness, and conservation. One example is NARAMA, an Expo of Reptiles and Frogs that was mounted in Adelaide to coincide with the Second World Congress of Herpetology. This expo was the biggest ever of its kind in the southern hemisphere. Amateur herpetologists still play a major role in providing specimens to researchers, particularly in museums, but also in universities. Much of this research contribution is basic to the conservation effort. They also verbally provide many opportune observations that elucidate major aspects of the natural history and conservation biology of Australasian reptiles and frogs. One notable recent example is the re-discovery of the Adelaide Pygmy Blue-tongue Lizard, *Tiliqua adelaidensis* by Graham Armstrong (Armstrong *et al.* 1993). Amateur herpetologists also have a strong involvement in herpetoculture, captive husbandry and keeping and captive observations on reptiles and frogs. In particular the area of snake biology owes much in Australia to the work of amateurs providing information and specimens to the institutional herpetologists. Most notable in this regard has been Rick Shine's amateur collaborators who provided a wealth of data which has found its way into the literature (Shine, 1991). Weigel (1992) discussed how Australian wildlife protection policies impede non-institutional herpetology. There is no doubt that is the case. Henle (1993) has pointed out similar problems. More importantly, these policies (combined with animal welfare legislation) impact seriously on all herpetology. These policies and legislation impede the effort needed to obtain the management data required for effective conservation.

Recently we had the situation of John Weigel who has committed considerable resources, both time and money, to seek out and explore the herpetology of very remote parts of Australia. A particular interest of his has been the finding of the Rough-scaled Python, *Morelia carinata* of the rugged and remote Kimberley. There are only two known museum specimens. In June 1993 he and Trent Russell risked their lives to find this species. They did find one juvenile Weigel (1993) and because of the beaurocratic problems they could only photograph it in the wild. For any museum or university based research team or person to make a similar expedition would cost more than it cost Weigel and it seems ludicrous that his efforts could not further profit

herpetology. It should have been simple and easy to bring that one specimen out from the Kimberley for further study without the fear of being ruined by a policy and legislation that in this case is insensitive to the herpetological and conservation opportunities.

Amateur herpetologists are keenly aware and interested in the promotion of sound animal welfare. I have not yet met an amateur herpetologist who has had disregard for the welfare of the animals that she or he either studies or keeps. The people who know most about herp welfare are in fact these field workers, keepers and breeders. It is almost an insult that those who wish to publish their studies should be supervised and administered in the animal welfare area by people who mostly at present have little or no knowledge of reptiles and who apply their inappropriate knowledge about endothermic laboratory mammals to all animals. It is like a ship's captain telling a chief pilot how to fly his aircraft, and it does little to engender respect for these misguided representatives of the laudable principles of animal welfare.

STATUS

The collective status of amateur herpetology in Australasia is generally not what it ought to be, particularly if status is measured according to the regard in which amateur herpetology is held by those who are in authority and power, particularly wildlife authorities. There is also a significant proportion of institutional herpetologists in Australia either with or without amateur origins who do not give amateur herpetology its due credit. There are approximately 10 to 15 senior and influential institutional wildlife biologists and herpetologists who fall into various levels in the detractor category. This problem has been surveyed by Mirtschin (1993), Weigel (1992) and also by the Australasian Affiliation of Herpetological Societies (Anon, 1992). There are widely diverse views on the status of amateur herpetology in Australasia. The detractors usually search out negative aspects of past amateur herpetology to justify their suppressive and restrictive policies and outlooks. These are then applied to discourage, limit or simply stop amateur herpetological interests and contributions. Any positive aspects are either played down, discounted, grudgingly acknowledged or even denied.

Negative opinions towards amateur herpetologists and amateur herpetology abound. There is a repertoire of misleading and false information which is trotted out by the antagonists whenever the occasion arises. The most serious are the innuendos and suspicions that are raised both in the media and in rumour-mongering. In particular there is an often implied connection between amateur herpetology generally, and the smuggling of reptiles and frogs out of Australia and New Zealand. All the indications from overseas price lists are that the level of this illegal export is so low and in ecological and population terms it is quite insignificant (survey of 25 recent lists from USA and Europe). There are sound reasons for believing that the claims about large consignments being smuggled are red herrings. The take home message particularly to some wildlife authorities and institutional herpetologists about amateur herpetology is this: Amateur herpetologists might be rough diamonds but they are still diamonds: and if suitably nurtured and acknowledged they are a great compliment to herpetology, as well as an essential one if we are to obtain the necessary information to implement effective biodiversity conservation.

THE FUTURE

Strahan (1985), in his opening remarks to the Australasian Conference of Herpetology at the Sydney University in 1984 said that at last Australasian herpetology had become a respectable science. It is important also that amateur herpetology in Australia become more highly regarded both within herpetology and certainly by fauna authorities, much more so than is the case at the moment.

Of all the Australian states the attitude of the Western Australian fauna authorities to amateur herpetology is the most negative with a quite distorted emphasis on the potential negative

activities of amateur herpetology. I have heard the comment that the Western Australian fauna authorities have an attitude and policy towards amateur herpetology that can be likened to the attitude by Tasmanian authorities toward human sexual behaviour.

One analysis of the attitude and policy of fauna authorities is that they have been overly concerned with the promulgation of their own position and power at the expense of the welfare and conservation of wildlife. We have yet to see an analysis or paper by any Australasian fauna authority demonstrating that the present blanket protection policies (which so adversely affect amateur herpetology) are working to conserve these species in the wild. Now that the Reptile Action Plan (Cogger *et al* 1993) has been published and the Frog Action Plan is imminent (Tyler 1993) the information is available to rationalise policy and legislation. A very recent example of the dismissive and assumption-driven outlook towards change by one senior fauna officer is to be found in Henle (1993 at p.386). The writer had outlined the ineffectiveness of statutory species conservation and the need to facilitate amateur herpetology. To this the editor (a senior fauna officer) added "[Not many Australian zoologists would be in agreement with the author's suggestions, but I find it interesting to hear the above views put so clearly - Ed.] Indeed it may be so that not many Australian zoologists would be in agreement, but shouldn't herpetologists be asked? And if they were I believe many would agree. To downgrade Henle's suggestions with this editorial dismissal is not conducive to keeping an open mind on these questions.

A feeling and self-sense of criminality in many amateur herpetologists (and a good number of professionals I have spoken with) is engendered by the existing complicated, often irrelevant legislation. This perception in part causes institutional herpetologists to distance themselves from amateurs. Some institutional herpetologists have sponsored and helped amateurs they trust. Such support needs to become more widely accepted, practiced, and facilitated, particularly by simplifying and easing restrictions on amatuer herpetology. The potential of greater amateur involvement in Australasian herpetology needs to be discussed and realised by institutional herpetologists and fauna authorities. The rewards for all concerned are well worth the effort. Williams (1993) in urging just this sort of change made "a plea to put science back where it belongs: in everyone's grasp. Keeping science to the professionals is as absurd and counterproductive as having only Olympic athletes, the experts, practicing sport." Herpetologists from all sectors have much in common and herpetology and our reptiles and frogs are done a disservice by the divisions that are allowed to persist through misunderstanding and inappropriate legislation.

Greer (1989) pointed out the serious impact that fauna legislation is having on the practice of herpetology by amateurs and Shine (1991) similarly pointed out some of the flaws in Australia's fauna legislation. The restrictions of the past 20 years on amateur herpetological activities and the development of herpetological skills pose a serious long-term risk to herpetology. Almost all the 23 present day herpetologists identified as being highly productive and of amateur origins developed their interests at a time when there were few or no legislative restrictions. These people are like mature trees in the forest of herpetology: but are today's seedlings now able to develop towards maturity? Or are they being nipped in the bud? Many herpetologists are concerned. Honegger (1994) concluded that "without the participation of knowledgeable amatuers in captive breeding there will be little further engagement in conservation of habitats and finally the number of engaged herpetology-students will decrease and...apathy... towards lower vertebrates will increase even more." He urged active involvement by amateurs in elucidating aspects of biology which are of direct use in conservation and further that they should not be prevented from doing so by "impeding and unrealistic laws".

There are problems associated with unlimited amateur herpetological activities, but these can be resolved more easily than the detractors would have us believe. Herpetology and conservation would benefit significantly from a rationalisation of the present restrictive policies and interpretations of legislation. Indeed in the present economic and political climate it can be

demonstrated that public servants who do not adequately evaluate and facilitate positive involvement and contributions by amateurs to herpetology and conservation are wasting community resources, and should be corrected.

Amateur herpetology in Australasia does have a large and honourable place in the science's past and present. Its status can be improved for the benefit of herpetofauna, conservation and all who share the many common interests and concerns. The problems are acute and legislation has already damaged the collective information output by driving many potential contributors "underground". The beneficial roles that amateur herpetology has played are cornerstones of Australasian herpetology. These roles can and should be expanded by removing the present stifling legislative excesses. The future can be brightened and it should be. Consultation, co-operation, facilitation and focusing on the all-round benefits of change are worthwhile directions.

The recent Second World Congress of Herpetology in Adelaide adopted a resolution that encourages continued and wider amateur involvement and urges a review of current legislation. The full text of the resolution is printed elsewhere in this issue of Herpetofauna. This resolution is the nearest we have to a world-wide herpetological opinion on amateur herpetology. It will hopefully improve the lot of amateur herpetologists in Australasia as well as the rest of the world.

Anon, 1992. Editorial: a case for significant deregulation of the keeping and taking of reptiles and frogs. *Herpetofauna* 22(1):1-2.

Armstrong, G. & Reid, J. 1992. The rediscovery of the Adelaide Pygmy Bluetongue *Tiliqua adelaidensis*; (Peters, 1863) *Herpetofauna* 22(2): 3-6.

Banks, C.B. 1982. Herpetology in Australia. *British Herpetological Society Bulletin,* No. 5: 20-23.

Cann, J. 1986. *Snakes Alive.* Kangaroo Press, Sydney.

Cogger, H.G. 1985. Australian proteroglyphous snakes - an historical overview. Pp 143-154 in G. Grigg, R. Shine and H. Ehmann (eds) *Biology of Australasian Frogs and Reptiles.* Surrey Beatty & Sons with the Royal Zoological Society of NSW

Cogger, H.G. 1993. History of the discovery of the Reptilia. Chapter 13, p 92-97 in *Fauna of Australia Volume 2A Amphibia and Reptilia.*

Cogger, H.G., Cameron, E.E., Sadlier, R.A. & Eggler, P. 1993. *The action plan for Australian reptiles.* Australian Nature Conservation Agency Endangered Species Program Project Number 124.

Greer, A.E. 1989. *The biology and evolution of Australian lizards.* Surrey Beatty & Sons, Chipping Norton.

Henle, K. 1993. Issues in Australian herpetology: a view from abroad. Pp 366-371 *in* eds D Lunney & D Ayers *Herpetology in Australia: a diverse discipline. Transactions of the Royal Zoological Society of NSW,* Sydney.

Honegger, R.E. 1994. Amateurs-conservation and captive care. Plenery Session paper at Second World Congress of Herpetology, Adelaide and to be published.

Krefft, G. 1869. *The snakes of Australia: an illustrated and descriptive catalogue of all the known species.* Facsimile edition 1984. Lookout Publications, Brisbane.

Mirtschin, P.J. 1993. A case for deregulation of the keeping and taking of reptiles. *Herpetofauna* 23(1):1-6.

Shea, G, M. 1994. Amateur contributions to herpetofaunal field studies: an Australian perspective. Paper given at Second World Congress of Herpetology, Adelaide and to be published.

Shine, R. 1991. *Australian snakes: a natural history.* Reed Books, Sydney.

Tyler, M.J. 1993. Preparation of the Australian Frog Action Plan. Pp 229-231 in eds D. Lunney & D Ayers. *Herpetology in Australia: a diverse discipline. Transactions of the Royal Zoological Society of NSW,* Sydney .

Weigel, J. 1992. How Australian wildlife protection policies impede herpetology. *Herpetofauna* 22(2):7-14.

Weigel, J. 1993. A record of a third specimen on the Rough-scaled Python *Morelia carinata. Herpetofauna* 23(2):1-5.

Williams, R. 1993. Trends in science: creating confusion. *Australian Natural History,* Winter 1993:20.

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RESPONSE TO BOOK REVIEW

In a review of the book *Smuggled - The Underground trade in Australia's Wildlife* by Raymond Hoser (*Herpetofauna* 23(2)) I posed the question as to where the author had obtained the first person conversations in the "Jones case". Peter Jones had informed me that Raymond Hoser had never interviewed him about the matter.

My question has been answered. Raymond Hoser supplied me with a copy of a tape recording which I am satisfied is of a conservation between Peter Jones and several other people, including Raymond Hoser. Raymond Hoser states that the conversation was legally recorded. It has been suggested that some aspects of the review appear to cast doubt on the credibility of the book and it's author. No such intention was intended and any such inference was accidental. The review merely expresses my impression of the book. In the interests of fairness we publish below Raymond Hoser's response to the review.

Gerry Swan.

May I thank the editor of *Herpetofauna* for the right to publish corrections to a previous review of my book, *Smuggled-The Underground Trade in Australia's Wildlife*. The general thrust of the review was negative and contained a number of defamatory and untrue statements. Seven of the nine paragraphs were openly hostile to the book. The reviewer appears to have used a series of flawed arguments in an attempt to build up a case with which to attack the credibility of the book and the author (myself). Following is a rebuttal of the key arguments.

In relation to the Peter Jones case, (para 6) the information came from several sources (some cited in bibliography) and a conversation I had with him. That was outside the Australian Museum on 24/1/92 following a lecture I gave to the Australian Herpetological Society. In line with statements made on page 5 of *Smuggled*, the conversation was taped and it was from that transcript the first person quotes were taken. In that case , I went beyond protocol and even quoted Jones' 'um's' and ah's'. I can only speculate as to why he'd subsequently deny having had the conversation.

The comments by the reviewer in relation to the formation of the Reptile Keepers Association (RKA) (para 7) are rejected. The RKA did as its initial and major objective prepare a lengthy report to the New South Wales government calling for a major overhaul of the way the New South Wales National Parks and Wildlife Service (NPWS) dealt with reptile keepers and laws in relation to the same.

In relation to the reviewer's comments which were based on comments by Mike Schooley (para 5), I was aware of those views prior to publication of *Smuggled*. On the points in *Smuggled* Schooley disputed, a number of investigative journalists including Dick Wordley gave evidence to the contrary. As they were in some cases closer to the scenes of the alleged crimes their versions were accepted. Furthermore in a case involving a female journalist, Schooley got the case he was familiar with mixed up with one documented by John Nichols in his book *The*

Animal Smugglers. Interviews with Wordley, and several customs officials including Schooley were all recorded. In relation to the Wordley allegations, the fact they'd been primarily sourced from him was clearly indicated in both text and bibliography of *Smuggled*.

The statement that I had accepted "articles in the tabloids at face value" (para 8) was clearly misleading. Besides failing to acknowledge the research involved prior to writing *Smuggled*, the reviewer should have noted my comments to the effect that the bibliography was incomplete. From a reader's point of view, previously published newspaper articles would be far easier to source than departmental documents, tapes, personal letters, court records and so on, thereby explaining why these were cited as a first preference. Sources of more contentious information were directly quoted in the text of *Smuggled*.

Comments to the effect that there was a lack of editorial discipline (para 2) are rejected. The layout and format strictly conform with the guidelines published by the Australian Government Publishing Service in their Style Guide for authors, editors and printers. The comment by the reviewer that "the photos do not appear to serve any useful purpose" is reckless comment. They absolutely illustrate the text subject matter covered in the book, namely wildlife busts, wildlife officials, smuggled species and so on. The comment that I "had adopted a rather scatter gun approach to the subject" (para 2) is also rejected. The reviewer did not offer an alternative method of dealing with the subject and as it had never been previously covered in book form there was no established layout to emulate (as for example may be the case with a book on reptiles).

The reviewer's claim that I offered "no names or hard evidence" (para 4) is rejected. It appears he ignored the text of the book and failed to read captions to many photos. I'd further suggest that my mentioning of names and presenting hard evidence explains why unprecedented attempts have been made to suppress *Smuggled*. Perhaps it might be rude for me to make mention of the Peter Jones tape, itself hard evidence which the reviewer failed to account for.

The implication that I used "poetic licence" to make fiction out of fact (para 8) is also rejected. Whilst I accept that much of the information in the book is unpleasant, that doesn't make it untrue. Prior to publication *Smuggled* was checked and verified by a number of lawyers. It is a watertight document. This assertion is backed up by the fact that no one has been able to successfully action author or publisher for the material within *Smuggled*, even though a substantial number of people are adversely named.

Raymond Hoser.

CAPTIVE MANAGEMENT OF THE PIG-NOSED TURTLE, *CARETTOCHELYS INSCULPTA*

Chris Dorrian
Taronga Zoo, P.O. Box 20, Mosman, 2088

ABSTRACT

Until now nothing has been published on the requirements or behaviour in captivity of *Carettochelys insculpta*. The Reptile Department of Taronga Zoo has successfully maintained a small number of these animals since 1989. Studies on their interactive behaviour showed that the Pig-nosed turtle will not peacefully co-exist with members of its own species in a captive environment.

Tests were conducted with two animals being placed into a glass tank divided in half by a clear perspex sheet. Whenever the larger turtle became visually aware of the second animal, it would swim quickly toward it, mouth agape before colliding with the divide, and would bite at the divide until the smaller animal moved out of sight.

When introduced into a large communal tank, the same aggressive behaviour was observed toward individuals of its own species, but not towards or from, *Chelodina expansa, Ch.longicollis, Emydura krefftii* or *Elseya latisternum*. A sympatric species, *Chelodina rugosa,* attacked each member of *C.insculpta,* biting at the head and flippers, whenever visual contact was established.

The animals are fed an undemanding omnivorous diet. Each shows a distinct individual preference for certain vegetation, and all favour an herbivorous rather than a carnivorous diet.

INTRODUCTION

Carettochelys insculpta is a morphologically distinct species of freshwater turtle. The limbs are modified as flippers, and like marine turtles the swimming action enables the pig-nosed turtle to quite literally fly through the water. It is also the only Cryptodire turtle native to Australia, all others belong to the infraorder Pleurodira which are side-necked turtles. *C.insculpta* is related to the soft-shelled turtles of the family Trionychidae (Ernst & Barbour, 1989). The formerly widespread family of Carettochelyidae is today represented by only one extant species restricted to southern New Guinea and northern Australia. Commonly known as the pig-nosed, pitted-shell or Warradjan Turtle, the species has been well documented since its discovery in this country. The research and subsequent publications, however, have dealt almost exclusively with wild populations. Literature regarding husbandry techniques in keeping these animals in a captive environment appears to be non-existent.

BACKGROUND

C.Insculpta was described in 1886 by Dr E.P. Ramsay from a single specimen. This being one of two turtles collected from the Fly River in New Guinea by explorers W. Froggat and J.H. Shaw.

The first report of the pig-nosed turtle being resident in Australia was 1969, when a single specimen was caught on a fishing line from the Daly River in the Northern Territory. A photograph of this animal was sent to Dr Harold Cogger at the Australian Museum who requested further specimens and an additional nine turtles were subsequently caught and measured. The smallest, a sub-adult with a carapace length of 265mm, was forwarded live to Dr Cogger and was housed at Taronga Zoo. The existence of *Carettochelys insculpta* was still not widely known until the publication of scientific literature (Cogger, 1970; Peters, 1970).

Populations have also been located in Northern Australia in several rivers of the Victoria and Alligator River systems (Cogger, 1992). Cann (1978) considered additional populations probably occur in many rivers along the north coast.

Heaphy (1990) estimated that males in the Daly River reach sexual maturity between 14 and 16 years of age at a size of about 300mm (carapace length) and females between 20 and 22 at 330mm. The lengthening tail of the male may be apparent from 10 years onward. The largest male observed by her in the Daly River between 1986 and 1988, had a carapace length of 372mm and the largest female a carapace length of 413mm.

Georges and Kennett (1989) report that the largest male observed in Pul Pul billabong, Kakadu National Park, had a carapace length of 454mm and weighed 9.5 kg and the largest female a length of 523mm and weighed 16.0 kg.

The largest specimen collected was in Irian Jaya by John Cann. This animal had a carapace length of 550 mm. Cann (1978) thought it is possible that females may reach a carapace length of 600mm (Cann, 1978).

Females lay between 10 and 30 round eggs (39 x 40mm) during the dry season, between April and November. A nest observed in the wild produced hatchlings after about 70 days (Georges and Kennett, 1989). Webb, et.al. (1986) found that three clutches artificially incubated showed that the sex of hatchlings was temperature dependent. Eggs incubated at 28°C and 30°C hatched after 101 days, and 69 days respectively. Both clutches produced all male hatchlings whilst the third clutch, incubated at 32°C saw the emergence of all females after 53 days.

CAPTIVE HISTORY

Taronga Zoo currently houses three subadult *C.insculpta*. Two were donated on 13 December 1989 by Dr Arthur Georges from the University of Canberra. These had hatched in December 1985. A further specimen was acquired from Barry Springs on 23 May 1991. This animal appears to be about five years old. The carapace length of the three individuals are No. 1, 195mm, No. 2, 173mm and No. 3, 125mm.

MATERIALS AND METHODS

A glass aquarium tank, 120 cm long by 46 cm wide by 46 cm deep, was divided in half by means of a clear perspex sheet with a number of holes drilled into it to allow water circulation. No. 3 was placed in one half and No. 2 in the second section. It would appear visual contact triggers aggressive behaviour. The two had been in the respective compartments of the tank for eight minutes before the smaller animal (No. 3) approached the perspex divide and the larger individual (No. 2) became aware of it, and quickly swam toward No. 3, stopping when it collided with the perspex. No. 2 immediately began biting at No. 3, whose nose was touching the divide. Although no actual contact was made, the fury of the attack startled the smaller animal who pushed backwards from the wall and retreated to the far end of the tank, taking refuge behind a sunken log. Once visual contact was lost the aggressor (No. 2) showed no further interest and returned to the bottom of the tank.

The animals were rotated and always the larger turtle was the aggressor.

It was thought that if the turtles were placed into a less confined body of water it may negate this aggressive behaviour, however, this did not prove to be the case.

No. 1 and No. 2 were introduced into a communal display tank housing several species of Chelids, *Chelodina expansa* (3), *Chelodina longicollis* (4), *Chelodina rugosa* (1), *Elseya latisternum* (1), and *Emydura krefftii* (3). This tank holds approximately 16,000 litres of water and has a water surface area of about 15 sq.m. Each time the subject animals came into contact the larger (No. 1) immediately gave chase to the other, mouth agape, ready to bite. These pursuits occurred several times over the following six hours and when it became obvious that

the larger turtle was not going to tolerate the smaller's presence, the smaller individual was removed.

A few days later, it was noticed that No. 1 had a bite mark on the top of its head. Monitoring the enclosure showed the offending animal was *Ch.rugosa*. *C.insculpta* was removed and replaced in turn with each of the remaining two *C.insculpta*. It was observed that each time visual contact was made, *Ch.rugosa* would give chase to *C.insculpta*, biting at the head and flippers. This aggression was not pursued when *C.insculpta* outdistanced its adversary.

The Northern Snake-neck, *Chelodina rugosa*, ranges across river systems of northern Australia and members of it are sympatric with *C.insculpta*, but it is unknown whether the aggressive attitude shown by this individual (a female) is typical of the species, or of interaction in their natural environment.

DISCUSSION

Although these animals display no aggressive behaviour when handled, or toward turtles of the family Chelidae, the pugnacious attitude shown towards members of their own species prohibits pig-nosed turtles from being displayed as a group. Different combinations were tried, but the larger animal always harassed the smaller, constantly chasing it and trying to bite.

From personal experience it is known that males of some species of Chelidae are known to attack each other if placed in a confined area. However neither individual of *C.insculpta* show any of the characteristics typical of mature individuals.

Heaphy (pers. comm.) kept four *C.insculpta* at the University of NSW in 1988. These were housed together in a large pool with sunken drums in which they could take refuge. The largest animal, a female with a carapace length of 390mm behaved aggressively toward the three smaller turtles whenever they emerged from their retreats. The three small animals would shelter peacefully together, but on removal of the large female, the next largest would assume the role of aggressor. When the large female was returned, she would resume dominance and the next largest would rejoin the other two.

HOUSING

Each animal is now housed in its own water filled enclosure with the water heated to a constant 26-27°C. These temperatures are closely monitored as it has been noted in the past captive pig-nosed turtles have developed and died from pneumonia (Heaphy pers. comm.).

Power-Twist fluorescent tubes emitting ultra violet light are suspended approximately 20cm above each pond. These are illuminated for 11 hours each day. To provide access to natural sunlight, the animals are rotated to a shallow outdoor pond on a daily basis during the summer months. Heaphy (1990) reports that groups of *C.insculpta* were observed in situ basking just below the surface level in shallow water.

Although *C.insculpta* does not emerge from the water to task, each has a suspended platform with an access ramp. These platforms were installed as a precautionary measure that in the event of the submersible water heater malfunctioning the animal can escape the water before it overheats.

DIET

Pig-nosed turtles are opportunistic omnivores. Foods recorded from field observations include figs, pandanus fruits, flowers, leaves, and seeds that fall into the water from riparian vegetation. Water snails, mussels, insect larvae and carrion have also been recorded from their faeces. (Georges, 1987).

Taronga turtles are fed a wide range of foods including Paw paw, broccoli, banana, figs, mulberry, orange, peas, sweet potato, milk thistle and hibiscus flowers. Pink mice, small whole

fish, yabbies and prawns (unshelled but with heads removed) are also offered and eaten on a regular basis.

Observations of our captive individuals show a distinct preference towards herbivory rather than carnivory. For example, when offered pieces of paw paw, prawns and pink mice simultaneously, each animal will eat the paw paw first. Individual dietary preferences have been observed. For example, only one animal will readily eat dried fig, but, unlike the others, that individual shows no interest in mulberry leaves.

CONCLUSION

Although the most unique of Australia's freshwater turtles, my observations suggest that *Carettochelys insculpta* cannot be displayed in the company of members of its own species without an expectation of injury. Individual aquarium tanks would appear to be the only successful way to exhibit more than one animal.

ACKNOWLEDGEMENTS

My thanks to Dr Linda Heaphy for allowing me access to her unpublished Ph.D. thesis, and to Rolf Bichbaumer for translating "Die Papua-Schildtkrote *Carettochelys insculpta* in Australien!"

REFERENCES

Cann, J. (1978). Tortoises of Australia, Angus and Robertson.

Cogger, H. (1992). Reptiles and Amphibians of Australia, Reed Books.

Cogger, H. (1970). First Record of the Pitted Shelled Turtle, *Carettochelys insculpta* from Australia. Search, Vol. 1, July 1970.

Earnst, C. and Barbour, R. (1989). Turtles of the World. Smithsonian Institution Press.

Georges, A. and Kennett, R. (1989). Dry Season Distribution and Ecology of the Warradjan *Carettochelys insculpta* in Kakadu National Park, Northern Australia. Aust. Wildl. Res., 16.

Georges, A. (1987). The Pig-Nosed Turtle Warradjan, Australian Natural History, Vol. 22, No. 5.

Heaphy, L. (1990). The Ecology of the Pig-nosed Turtle *Carettochelys insculpta* in Northern Australia (unpublished Ph.D. Thesis, Aug. 1990).

Heaphy, L. (1993). Personal Communication.

Peters, U. (1970). Die Papua-Schildtkrote *Carettochelys insculpta* in Australien! (In German) Datz. 6 23 Jahrgang.

Webb, G. Choquenot, D. and Whitehead, P. (1986). Nests, Eggs and Embryonic Development of *Carettochelys insculpta* from North Australia.

FROM FEAR TO FRIEND

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This paper was presented at the One Day Theme held on 29.12.1993 to coincide with the Second World Congress of Herpetology in Adelaide.

Reptile and amphibian exhibits and presentations at zoos and fauna parks have an extremely important role to play in educating people about herpetofauna.

To be effective it is important to assess the starting point of any educational experience before you begin. The background knowledge, experiences, values and attitudes of any audience should be considered as part of this assessment. When considering attitudes to herpetofauna, phobic conditions are too often encountered. Herpetophobia (the fear of reptiles and amphibians) especially the fear of snakes (ophidophobia) is one of the most common phobias. But with snakebite resulting in only one to two deaths per year in Australia ... where does this relatively baseless revulsion originate?

Unfortunately the religious background of the community holds a lot of the blame. Reptiles, particularly snakes, are biblically linked with evil and are thought to be creatures of ill-omen. Even children's stores are responsible for many childhood fears. The Australian classic children's story "Snugglepot & Cuddlepie" with the "evil Mrs Snake" is a good example.

It is clear that herpetofauna education is up against an extremely hostile cultural background but, reptile and amphibian phobias are learned therefore they can be "unlearned" (Simpkin, 1993).

Fortunately, gone are the days when education was of low priority when the "Pit of Death" appeared at country fairs and reptile exhibits were overcrowded, writhing masses of snakes and lizards (Cann, 1986). The zoos and fauna parks that I have visited in Australia, USA and the U.K. have come a long way since those days. Too often however they have chosen an educational path that does not effectively take into account the hostile cultural and social backgrounds and, as a result do not do enough to counter herpetophobia. In fact, they will often reinforce the existing fears.

Aesthetically pleasing exhibits such as habitat displays, signage and presentations avoiding words and wording with unsympathetic meanings will significantly help to overcome these social and cultural barriers.
The exhibition of any reptile or amphibian should impart a sense of dignity and respect for the animals and dismantle any negative feelings (Simpkin, 1993).

EXHIBITS

Herpetofauna exhibits are in a unique position to portray reptile and amphibians in a very positive and aesthetically pleasing environment. Most exhibits do just that, although I have only recently seen exhibits that displayed reptiles in a variety of squalid conditions. For example, cages without fresh water, without substrate, and with a build-up of faeces. It is my belief that no animal deserves to be displayed in this way. By demonstrating (as in the previous example) that they are not worthy of our care we are teaching our already phobic visitors that reptiles do not deserve **their** respect either.

A commonly encountered feature of many reptile exhibits is some form of barrier to keep visitors back from the glass. Barriers imply danger and will often reinforce visitors' phobias. Unfortunately though, in some cases barriers are unavoidable. At Featherdale Wildlife Park we have totally dispensed with barriers and allow and actively encourage close eye to eye viewing of even the most venomous species.

People are often lured to reptile exhibits through a morbid fascination and will visit with a similar curiosity to that which attracts people to the "Chamber of Horrors". It is my belief that aesthetic

appeal is a far more beneficial lure to an exhibit, and psychologists suggest that phobias are best overcome in an atmosphere that is very positive and comfortable (Smith, 1977).

At Featherdale the positive, comfortable atmosphere is set by making the entrance to the display accessible via the kangaroo and koala sanctuary. Healesville Sanctuary in Victoria have gone one step further by actually employing the services of a theatrical designer to give the reptile complex the most aesthetically pleasing atmosphere possible (Simpkin, 1993).

SIGNAGE/GRAPHICS

A more subtle aspect which can reinforce phobias is the language used in exhibit graphics and signage. Emotive words such as dangerous, aggressive, attack and deadly occur very commonly in reptile exhibit signage. These words are unsympathetic and detract from the message that we prefer to present. Exhibit graphics also often place too much emphasis on unsympathetic facts. A very good example of this is the tendency to concentrate the message on the subject of venom, which is just one of many snake adaptations. Also, by acknowledging phobias directly in signage, we risk setting it more deeply in the visitor's minds (Simpkin, 1993). Any signs should keep the information relevant to the animal in its natural habitat, as it would on the signs and graphics for any other animal.

To illustrate the problems created by the language used in signage, consider the following two examples of extremes.

Sensational/Clinical approach:
Fierce snake *Oxyuranus microlepidotus*

This species of snake has the most toxic venom of any terrestrial snake in the world.
This large deadly species delivers an average of 218,000 mouse LD50 doses of venom per bite - an equivalent to an "atomic bomb" for overkill. A single dose can certainly kill many people.
The venom is mainly neurotoxic and causes paralysis and then death.
Its distribution centres on far western Queensland where it feeds mainly on rats.

Empathatic approach:
Inland Taipan

This shy and rarely encountered species is found in the remote and arid areas of far western Queensland.
The delicately patterned scales aid camouflage and make this species one of Australia's most beautiful snakes.
Remarkably this species has the ability to increase the pigment in its scales to make itself darker in the cooler winter months to absorb more warmth from its environment.
Feeding mainly on rats, the Inland Taipan or "Small Scaled Snake" has a potent venom to efficiently subdue its prey. Its venom can also be used to defend itself.

Both these accounts are factually accurate, but the message each communicates is very different.
Ignorance may "breed contempt", but overcoming contempt is not a simple consequence of overcoming ignorance.

PRESENTATIONS

The same language and wording problems are encountered in reptile presentations involving a keeper or fauna educator talking about and talking with live handled specimens. This could be in a zoo, fauna park, in a shopping centre or in a school.

Reptile educators and herpetologists in Australia seem to love to dwell in their presentations on "venom facts" and where each venomous species ranks in the top ten most dangerous snakes in the world. One presentation I have seen, barely mentioned anything else other than

the various snake venoms and their effects on humans. This information may be interesting to herpetologists, but does little to improve attitudes towards reptiles.

As with exhibits, creating an atmosphere that is comfortable and positive is also important in presentations. At Featherdale Wildlife Park the snake presentation is conducted in one of the most positive atmospheres possible, i.e. in the Koala Sanctuary! People enter the Koala Sanctuary to see and hold a koala and whilst on the "high" created by the koalas usually will not hesitate to touch or hold a python. We also avoid any emotive words such as aggressive, kill etc. as these detract from our message. Certainly many other presentations I have seen allow people to touch a python, but there is a significant proportion that will not take the opportunity.

The way animals are handled during a demonstration has a significant impact on audience perceptions. Some demonstrations have the reptiles teased or flicked around the pit with a snake hook. Sure, this may show that the handler has a mastery of the reptile, but it conveys the image that the animal is not worthy of our care. The focus is on the "bravery" of the handler, not the nature of the snake. A good demonstration of handling should have the animal held as gently as possible or if practical, moving freely around the presenter.

As Education Officer at Featherdale, I get the opportunity to educate children about reptiles and amphibians. Young children are often not yet phobic and any positive contact with these animals will have a large impact on their future attitudes.

Featherdale has been fortunate to be involved with the popular Australian TV soapie "A Country Practice" - native animals are frequently used and there is a snake in the story (e.g. Diamond python). Featherdale staff nearly always had a say in how the animals were portrayed in the storyline. We made sure the snake was made to be as friendly as possible and it was given the euphemistic name "Cuddles".

Whenever a Diamond python is used in presentations at Featherdale, we always call it "Cuddles". It is amazing to see how fast the mental barriers are broken down when the name "Cuddles" is mentioned. Compare this response to that received by calling a snake "Fang".

"Cuddles" isn't the only euphemism we use, and we always use words such as Beautiful, Lovely, and Friendly, again effectively breaking down the barriers and constructing positive attitudes towards snakes.

CONCLUSION

It is great to see most exhibits and presentations aiming to educate. But without first considering the rather hostile cultural background of people towards reptiles, the result is often reinforcing any fears held by visitors.

The approach taken at Featherdale and other fauna parks takes careful consideration of people's attitudes. This goes a long way to changing these attitudes for the better and in the long term improving the conservation prospects of these species.

REFERENCES

Cann, J. (1986). *Snakes Alive.* Kangaroo Press, Sydney.

Girault, Y. and Robinson, M. (1993). Contribution to the Study of Children's Conceptions of Reptiles. *Journal of the International Association of 200 Educators* 28: 45-47.

Melville, J. (1977). *Phobias and Obsessions.* Coward, McCann & Geoghegan Inc., New York.

Shine, R. (1991). *Australian Snakes A Natural History.* A.H. & A.W. Reed, Sydney.

Simpkin, L. (1993). From Phobia to Fascination. *Journal of the International Association of Zoo Educators* 29: 122-126.

Smith, M.J. (1977). Kicking the Fear Habit. The Dial Press, New York.

Sutherland, S.K. (1992). Death from Snake Bite in Australia, 1981-1991. *The Medical Journal of Australia* Vol. 157: 740-746.

NESTING SITE OBSERVATIONS OF THE DIAMOND PYTHON *MORELIA SPILOTA SPILOTA*

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INTRODUCTION

The observations in this article report on three clutches of Diamond python *Morelia spilota spilota* eggs found in the Wollongong area on the south coast of New South Wales. The nests were situated below the Illawarra escarpment in partly cleared eucalypt forest above the coastal plain. The observations were made on January 29 1994 and February 22 1994. In one case the young were hatching at the time the nest was found.

SITE 1

January 29, 1994

A clutch of python eggs was found below a large pampas grass (*Cortaderia*) clump in partly cleared forest vegetation. The female (approximately 2m in total length) was at this time (12.45 hours) curled around the clutch. On close examination I found the nest consisted of a basin shaped depression in the soil directly below the plant. The size of this depression was approximately 200mm in diameter and about 80-100mm deep. The soil and lower part of the clump were slightly moist and provided a humid environment around the eggs. The air temperature at the nest site was 29.2°C and the exposed grass area adjacent to the nest was 35°C. By using an electronic thermometer probe I recorded the temperature of the inner nest area at 25.1°C.

February 22, 1994

On returning to the site I found that the eggs of this clutch were, except for two, all hatched. There were a total of 29 eggs and the young neonates had dispersed. It was estimated they emerged within the previous two days. The two eggs that did not hatch were opened. One contained a neonate with a deformed head; the other egg was infertile. The deformed python measured 270mm in total length.

While I was inspecting the nest site the female was found close by, moving towards the nest. She was quite placid and it was observed she had lost weight during incubation period as the skin along the neck and body was rather loose.

The time was 10.26 hours and the air temperature was 24°C while the exposed grass area from which the python had come was warmer at 29 to 31°C.

Another egg clutch was discovered about 200m from the previous one. An adult python was observed basking in direct sunlight nearby and as she also appeared to have lost some weight it was assumed a nest was in the vicinity. After watching the python resting motionless for several minutes on dead pampas grass leaves, the roots of the plant were inspected. On lifting the dense leaves of the plant a clutch of hatching eggs was found. These were not disturbed and after photographs were taken the grass was replaced. The female remained undisturbed at the basking site. One of these neonates measured 280mm in total length. The nest was similar to that described previously. The observations took place at 10.40 hours and the air temperature was 25°C while the exposed grass area was warmer at 31°C.

SITE NO. 2

January 29, 1994

A Diamond python was located on a clutch of eggs in a formed depression in soil. This site was situated in a partly cleared region of the forest beneath trees and shrubs. The cleared sites, where sunlight was present, had a growth of lantana and pampas grass.

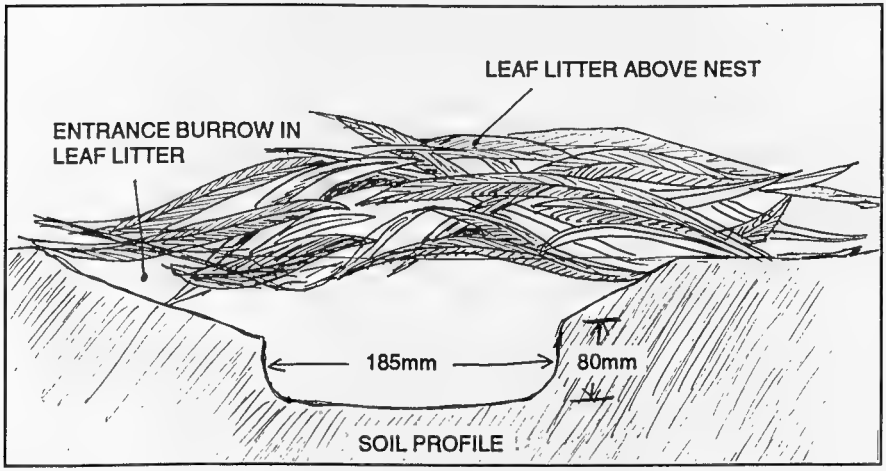
On removing some of the leaf litter near the base of a tree an adult python was found coiled on a clutch of eggs. This python refused to move from the eggs and remained in a coiled position. The time was 13.40 hours and the air temperature beneath the trees was 27°C but in nearby cleared locations the surface temperature was 36°C. By using an electronic probe it was found the nest temperature was 31.8°C. The litter was replaced over the nest. The python showed no aggression and remained with the eggs.

February 22, 1994

The nest site was again inspected and it was found that all eggs had hatched recently. They were still moist inside and it appeared the neonates left their eggs through a side burrow formed by the adult. There were a total of 26 eggs in this clutch. This python had coiled around the side and top of the clutch rather tightly and scale impressions were formed over many of the eggs.

As observed in the previous two sightings this python had formed a depression in soil below the leaf litter. The depression was basin shaped and measured 185mm in diameter and approximately 80-100mm deep.

Figure 1. Nest site No. 3 showing its basic shape and size below a dense deposit of leaf litter.



CONCLUSION

This python species is common and is often seen basking in cleared forest vegetation. It appears to favour open grass areas to lay and incubate eggs where heat from sunlight and moisture from rain is more readily available.

In all three cases the eggs were accommodated in a depression made in the soil. Possibly this is needed to confine egg clutches, to provide some protection from the drying effects of the wind, or to create a more humid environment.

Figure 2. Female python at nest site No. 1.

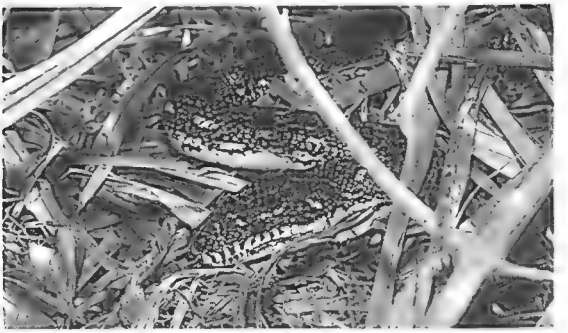
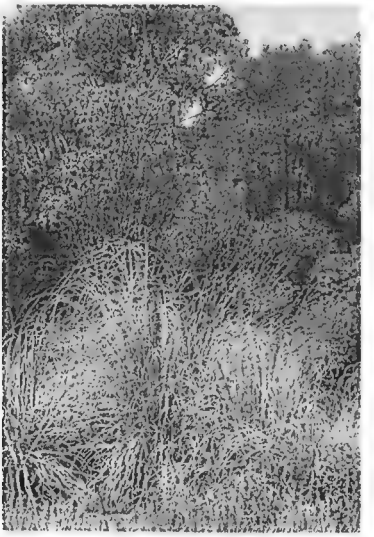


Figure 3. Young pythons emerging from eggs at nest site No. 2.

Figure 4. Pampas grass growth in cleared forest habitat.



SEA SNAKES IN THE CORAL SEA: AN EXPEDITION FOR THE COLLECTION OF ANIMALS AND VENOM

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SUMMARY

During the 1990 "Chesterfield" research expedition in the Coral Sea thirteen reef groups were examined for the presence of sea snakes. The areas examined included those en route to and return from the Chesterfield group, the most easterly destination. Six species of sea snakes were found with new reportings being made for two of the reefs examined. Venom from *Aipysurus laevis* was collected at each location for examination of geographic variation in this species.

INTRODUCTION

The Chesterfield group is a group of coral reefs and cays laying approximately 500km north-west of New Caledonia in the Coral Sea. The combination of being completely uninhabited, remote and in French jurisdiction warranted a closer examination of sea snake populations when an expedition to the area was approved. Other areas were examined en route to and returning from this group in order to obtain a more complete data base. The information obtained will help add to the previous records obtained by Rancurel (1973), Heatwole (1975) and Minton (1985) during past expeditions to those areas, as well as providing venom from *Aipysurus laevis* for the examination of geographic variation in this species. Future planned work on the venom may also help to shed light on species evolutionary migratory patterns, which is at present poorly understood.

MATERIALS AND METHODS

The 15 day expedition was organised by Dr Jim Charley of the University of New England, Armidale, NSW. It was a multi-purpose scientific undertaking, but this manuscript deals only with the sea snake aspects.

The research vessel, the 24.9m T.S.M.V. Kanimbla, owned and captained by Max Allen of Gladstone, Queensland, carried 19 scientists and five crew. Figure 1 shows the route taken from Gladstone and the other reefs and cays that were examined outside of the Chesterfield group.

Sea snakes were searched for at each of the sites listed in Table 1. With a small boat, using both snorkelling and manta-board techniques (Miller, 1979; Flemming, 1988), the reef edges and adjacent areas were covered at depths between 3m and 30m. Occasionally, however, Scuba was used for the deeper areas. Snakes were captured by grabbing them in the mid to posterior regions, avoiding the tail, and immediately placing them in a mesh holding bag. They were then taken to the surface and kept in plastic bins with fresh sea water. Snakes were milked for venom aboard the main research vessel by placing a plastic pipette tip onto each fang individually. Some pressure had to be applied to the venom glands in a few of the snakes in order to obtain venom. Venom was preserved in 10% acetic acid. After the milking procedures those snakes that were not required for museum specimens were released in their approximate area of capture. Cay examinations were also carried out for any dead snakes washed up onto the beaches as well as for living specimens of the genus *Laticauda*. The total number of each

species and the reef or cay from which they were collected is seen in Table 1. Habitat type and general activity was also recorded for each snake species (Table 2).

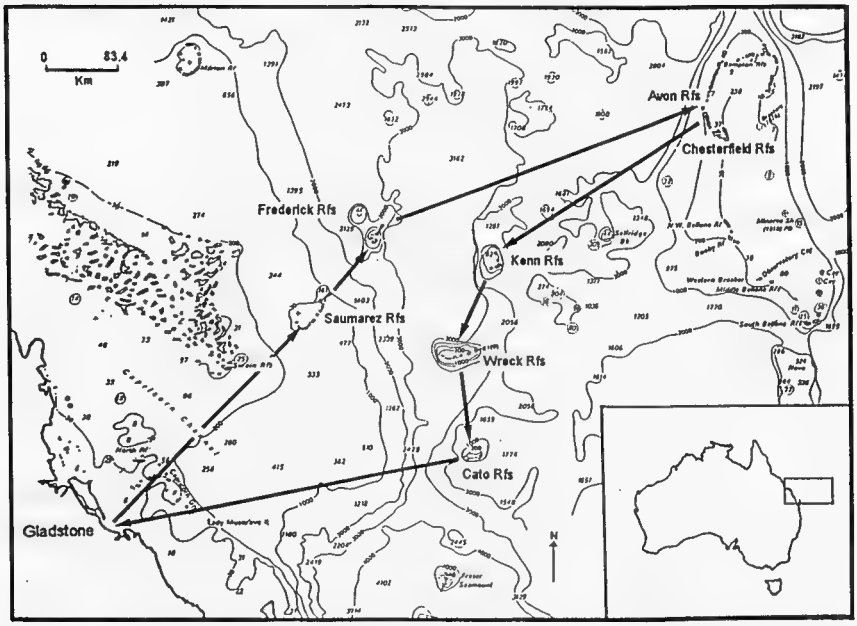


Figure 1: Map of the expedition route from the home port of Gladstone, Queensland to the Chesterfield group and return. Those reef areas along the expedition route that were examined outside of the Chesterfield Reefs are also indicated.

RESULTS

The total distance travelled during the expedition was approximately 1000 nautical miles or 1850 km. Not all of the areas searched during the expedition contained sea snakes. It can be seen from Table 1 that some of the areas in the Avon and Chesterfield reefs were fairly void of sea snakes. *Emydocephalus annulatus* were the most commonly encountered snakes with a large population seen at Anchorage I and Loop Islands. *Aipysurus laevis* was the next most abundant snake, being found along most of the route. This was the species targeted for the venom studies, so the widespread distribution complimented the intentions of the study. Two *Hydrophis* sp. were also seen in the Chesterfield group, but no actual area was assigned to them, hence they are not reported in Table 1. No *Laticauda* sp. were seen on any of the cays.

Table 2 presents the species of sea snakes caught or observed during the expedition with a brief description of the habitat in which they were most commonly observed, as well as their activities prior to capture.

The sizes of the *Aipysurus laevis* captured during the expedition ranged from 983mm to 1393mm with the largest weighing over 1.5 kg. Most of the *A.laevis* were females and no juveniles were seen. Figure 2 shows the largest *A.laevis* female, which delivered 0.5ml venomper fang during the venom milking procedure. Very little to no venom was obtained from the other species of snakes. Figure 3 shows one of the many *Emydocephalus annulatus* captured during the expedition. The colour patterns varied from this banded or mottled type to a solid dark colouring. The majority of *E.annulatus* did, however, possess some type of mottling.

Table 1. The names and coordinates of reefs and cays that were examined for sea snake presence during the 1990 Chesterfield Research Expedition and the numbers of snakes captured or otherwise identified. The snakes identified were *Aipysurus laevis, Aipysurus duboisii, Emydocephalus annulatus, Acalyptophis peronii and Pelamis platurus.*
- = none reported + = in excess of. Parenthesis contains the name of the reef group.

Reef/Cay	*A.laevis*	*A.duboisii*	*E.annulatus*	*A.peronii*	*P.platurus*
South West Cay (Saumarez Reef) 21°52'S, 153°27'E	2	-	2	-	-
North East Cay (Saumarez Reef) 21°40'W, 153°46'E	3	1	5	-	-
Frederick Cay (Frederick Reef) 20°58'S, 154°24'E	1	2	6	1	2
Avon Reef South (Avon Reef) 19°30'S, 158°15'E	-	-	1	-	-
Avon Reef North (Avon Reef) 19°38'S, 158°14'E	-	-	-	-	-
Long Island (Chesterfields) 19°51'S, 158°18'E	-	-	-	-	-
Bennett Island (Chesterfields) 19°54'S, 158°22'E	-	-	-	-	-
Loop Island (Chesterfields) 19°57'S, 158°28'E	1	-	15+	-	-
Anchorage I (Chesterfields) 19°54'S, 158°27'E	5	-	30+	-	-
Kenn Reef 21°14'S, 155°45'E	-	-	7	-	-
Bird Island (Wreck Reef) 22°10'S, 155°27'E	7	2	6	-	-
Cato Island (Cato Reef) 23°14'S, 155°32'E	4	-	-	-	-
TOTAL	23	5	73+	1	2

Figure 2: Photo of a large female *Aipysurus laevis* during a venom milking procedure. The snake's head is in the investigator's hand.

Table 2: The sea snake species captured or observed during the 1990 Chesterfield research expedition. The habitat that they were most commonly observed in as well as their activity are recorded.

SPECIES	HABITAT AND ACTIVITY
Aipysurus laevis	Deep coral areas usually foraging around coral and rocks
Aipysurus duboisii	Shallow bottoms resting on broken coral and sand
Emydocephalus annulatus	Shallow coral and rocky areas resting and foraging activities
Acalyptophis peronii	Shallow sandy bottom foraging in a burrow for food
Pelamis platurus	On the water surface
Hydrophis sp.	Swimming in areas with sandy bottoms

DISCUSSION

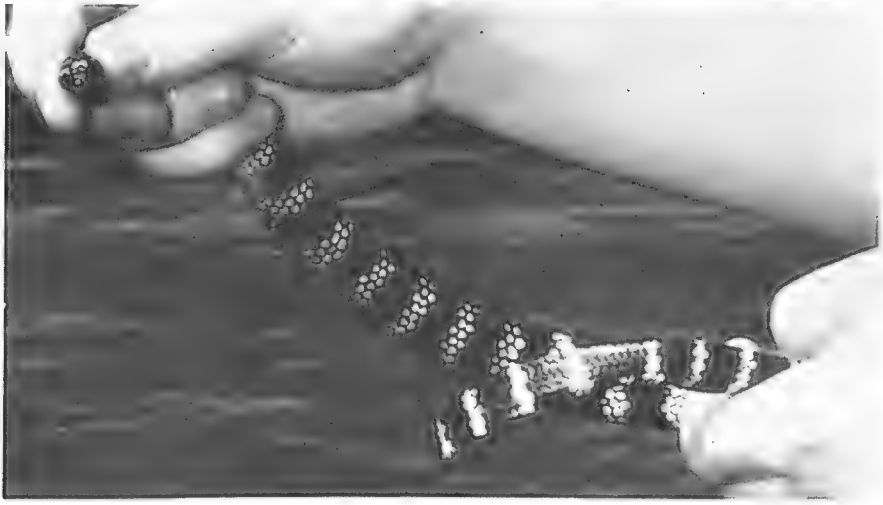
Sea snakes of seven different species were observed and six species were collected during the 1990 Chesterfield research expedition. Our findings are in agreement with previous reports by others (Rancurel, 1973; Heatwole, 1975; Minton, 1985) for these areas. We confirm their observations that the lagoon of the Chesterfield Reefs is abundant in *Emydocephalus annulatus* and *Aipysurus laevis*, but in contrast we found very few *Pelamis platurus* and *Hydrophis* sp. in this region. This latter observation may just be a seasonal variation.

New species were reported for both North East Cay (Saumarez Reef) and Frederick Reef. They were *Aipysurus duboisii* and *Acalyptophis peronii,* respectively.

The absence of members of the genus *Laticauda* in these areas is of interest, since *L.colubrina* and *L.laticaudata* are extremely abundant in New Caledonia only 500km away. The distribution of these and other sea snake species could be impeded by the great ocean depths that exist between the reef groups (Fig. 1).

The expedition proved successful in not only providing further records of sea snakes previously reported and new recordings for the areas visited, but also adequate amounts of venom from *A.laevis*. This venom will be used for comparative studies to determine geographic variation. Through biological and chemical testing, evolutionary migratory patterns could possibly be determined.

Figure 3: Photo of a typical *Emydocephalus annulatus* captured in the Chesterfield Reefs.



ACKNOWLEDGEMENTS

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REFERENCES

Cogger, H.G. (1975). Sea snakes of Australia and New Guinea. In W.A. Dunson (ed.), The Biology of Sea Snakes University Park Press, Baltimore. 59-139.

Dunson, W.A. (1975). Sea snakes of tropical Queensland between 18° and 20° south latitude. In W.A. Dunson (ed.), The Biology of Sea Snakes University Park Press, Baltimore. 151-162.

Flemming, N.C. and Max, M.D. (1988). Code of Practice for Scientific Diving: Principles for the Safe Practice of Scientific Diving in Different Environments. UNESCO Technical Report 53, Paris.

Heatwole, H. (1975). Sea snakes found on reefs in the southern Coral Sea (Saumarez, Swains, Cato Island) In W.A. Dunson (ed.), The Biology of Sea Snakes University Park Press, Baltimore. 163-171.

Miller, J.W. (ed.) (1979). NOAA Diving Manual. Diving for Science and Technology. US Dept. of Commerce, NOAA, Washington, D.C. 437pp.

Minton, S.A. and Dunson W.A. (1985). Sea snakes collected at Chesterfield Reefs, Coral Sea. Atoll Res. Bull. No. 292: 101-108.

Rancurel, P. (1973). Rapport de Mission aux Iles Chesterfield. ORSTOM Laboratoire, Noumea, New Caledonie, 21-28.

THE WESTERN AUSTRALIAN CARPET PYTHON *(MORELIA SPILOTA IMBRICATA)* HOW LITTLE WE KNOW ABOUT IT!

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INTRODUCTION

The subspecies *Morelia spilota imbricata* Smith (1981) occurs in the south-west of Western Australia. On the mainland it is found south-west of a line from Geraldton through Yalgoo, Kalgoorlie, Norseman and Cape Le Grand (Storr *et al* 1986). Its geographic range was recently extended to the east with a record from the Eyre Bird Observatory near Cocklebiddy (Griffin *et al* 1993). It is also found on several offshore islands in the Houtman Abrolhos and Recherche Archipelago as well as Garden Island near Perth. Outside W.A. it is known from St Francis Island south of Ceduna, South Australia (Schwaner *et al* 1988).

Local survival of this species probably depends on the retention of large undisturbed areas of bushland, the removal or fragmentation of which will effectively reduce numbers and eventually lead to local extinction. Several authors have commented on the decline of *imbricata* numbers (Bush 1981, Smith *supra cit*, and Pearson 1993). It must be mentioned that Smith's findings were based on museum specimens many of which would have been handed in by members of the public, not necessarily collected from the wild. This carpet python is listed under the schedule of specially protected fauna in CALM's Policy Statement 33. The combined effect of this special protection, and the over-restrictive controls on people privately keeping reptiles in W.A. is that our knowledge of this subspecies is virtually nil.

CONSERVATION

It is extremely difficult to effectively gauge the abundance of large reptiles like pythons and monitor lizards without using some form of radio tracking device. The cryptic habits of the *Morelia spilota* group (Diamond and Carpet Pythons) combined with their body colour and pattern which affords them excellent camouflage, make them appear to be scarce in the wild.

Shine (1991) comments that this supposed rarity was one of the reasons why he decided to study the Diamond Python. That study revealed some surprising ecological information about the species and Shine states: "Before long it became apparent that this species, far from being endangered, was present in remarkably high numbers even in the outlying suburbs of Sydney. Its apparent 'scarcity' is simply due to its magnificent camouflage and secretive habits". This may also be applicable to *M.s.imbricata* near Perth.

Listing an animal as threatened, endangered or otherwise does not mean it is safe. Rather it should be a matter of gathering information about the species, and establishing proper conservation management guidelines. The amount of published material on this subspecies is minimal.

An important management action for this subspecies would be to improve our knowledge and understanding by encouraging captive breeding. Unfortunately the current 'protective' legislation is not allowing this to happen. The irony is however that CALM Policy Statement No. 33 identifies the promotion of captive breeding along with other aspects as one of their many objectives. Cogger *et al* (1993) also states the encouragement of a captive breeding program for possible reintroduction of the species into reserves within its known range. Clearly government resources and funds are severely limited in many areas of biological research including captive breeding. These deficiencies could often be overcome by the activities of self-motivated naturalists who would have a considerable personal commitment. The utilisation of such people would be at little or no expense to government.

Our knowledge of the conservation status of this python is severely hampered by the blanket prohibition on the keeping of these snakes in W.A. This has resulted in a stifling of possible

research work by amateur herpetologists (Ehmann and Cogger 1985). Some relaxation of current legislation in conjunction with the positive encouragement of amateurs will improve our understanding of the ecology of several poorly known taxa (Pearson 1993). At present one gets the impression that *M.s.imbricata* is listed as 'specially protected' under the 1990 Schedule of the W.A. Wildlife Conservation Act 1950 purely as a convenience for enforcement (CALM Wildlife Officers, pers comm). It is our most familiar local python and is often kept by people which leads to investigations and prosecutions.

CARPET PYTHONS AROUND PERTH

The decline in python numbers in areas (Perth region, W.A. Wheatbelt and other agricultural regions) that have experienced large scale removal of habitat is not surprising. Because there is insufficient information on the actual abundance of this python in remaining undisturbed habitats, it is critical from a conservation perspective that these populations are studied both on the Swan Coastal Plain, Darling Range and elsewhere.

Carpet pythons seem to persist in reasonable numbers near Perth where disturbance has been minimal. Near Perth their greatest abundance appears to be on Garden Island. This island has a total land area of ca.1200ha and is partly occupied (20%) by the Australian Navy. The remaining land is managed as a National Park and visitation by people is kept to a minimum. The isolation and reduced habitat disturbance is reflected by the healthy python population. On a single warm night during February 1985 three pythons were found while spotlighting (Robinson *et al* 1987). To find this number on the adjacent mainland in one day or night would be extraordinary.

To gauge their abundance close to Perth I requested records of *M.s.imbricata* that had been removed from residential areas by four amateur herpetologists. This small sample excludes field observations and roadkills. Other amateurs were approached for python records but declined to participate. Since 1988 a total of 20 pythons have been removed from cars, aviaries and the roofs of houses at all times of the year, though mainly during the spring and summer periods (September-February). Of these 15 were males which is consistent with collection data for other large snakes in Australia. Males are the more active, particularly during the breeding season (Shine 1991). The two main areas where snakes were removed are the Darling Range and the more outlying northern suburbs on the coastal plain, primarily in coastal limestone areas. Both these areas still contain large portions of reasonably undisturbed habitat and national parks, but unfortunately also include prime real estate which increases the pressure on existing python populations. Only a few pythons were removed from the southern suburbs (of the Swan River). Historically the southern metropolitan region of Perth has undergone more rapid development than that to the north, and it has less areas set aside for the conservation of flora and fauna.

The occasional python turns up within the inner suburbs of Perth, distant from any bushland. These snakes may be escapees or may have been accidentally transported in produce or under vehicles. This situation is unavoidable but it does emphasise the need for education/public awareness programs and the importance of a snake removal service.

In recent years it has become obvious that around Perth there are two colour/pattern morphs. In the Darling Range (higher altitude) it is generally plain and darker, the blotches tend to merge with the ground colour. On the plain they are much paler and more boldly marked. Apart from these obvious colour/pattern differences there is also consistent diversion in the meristics of both morphs (Laurie Smith, pers comm). Whether this is consistent throughout its range is not known.

CONCLUSIONS

The greatest threat to existing populations of *M.s.imbricata* is the continual destruction of habitat, combined with the effects of introduced predators. It appears pythons still persist in reasonable numbers on large areas of undisturbed bushland throughout its distribution e.g. Darling Range, National Parks/Reserves and offshore islands.

Our knowledge of this python is generally poor. This is at least in part due to unrealistic protectionist views and to over restrictive enforcement which prevents responsible amateur herpetologists from being involved and contributing information. Positive collaboration of data has occurred recently between CALM and amateur herpetologists to determine the conservation status of pythons in Western Australia (Pearson 1993). As a result of this a proposed ecological study will be conducted on populations of *M.s.imbricata*, a project urgently required to gain information on this python.

ACKNOWLEDGEMENTS

I thank those amateur herpetologists who provided their python records to me and I commend the efforts of CALM research scientist David Pearson to involve amateurs in his work.

REFERENCES

Bush, B. 1981. Reptiles of the Kalgoorlie-Esperance region. Brian Bush: Esperance, Western Australia.

Cogger, H.G., Cameron, E.E., Sadlier, R.A. and Eggler, P. 1993. Pp 134-37 in The action plan for Australian reptiles. Australian Nature Conservation Agency. Project number 124.

Department of Conservation and Land Management. Policy Statement No. 33.

Conservation of endangered and specially protected fauna in the wild. July 1990.

Ehmann, H. and Cogger, H.G. 1985. Australia's endangered herpetofauna: A review of criteria and policies Pp 435-47 in Biology of Australasian Frogs and Reptiles, ed by G. Grigg, R. Shine and H. Ehmann. Royal Zoological Society of NSW: Mossman.

Griffin, P. and Hunt, T. 1993. First records of two reptiles *Morelia spilota imbricata* (Boidae) and *Tiliqua occipitalis* (Scincidae) from the vicinity of Eyre Bird Observatory, Western Australia. West. Aust. Nat. 19(2): 186-87.

Pearson, D.J. 1993. Distribution, status and conservation of pythons in Western Australia Pp 383-95 in Herpetology in Australia - a diverse discipline, ed by D. Lunney and D. Ayers. Royal Zoological Society of NSW: Surrey Beatty & Sons.

Robinson, D., Maryan, B. and Cooper, R.B. 1987. Herpetofauna of Garden Island. West. Aust. Nat. 17(1): 11-13.

Schwaner, T., Francis, M. and Harvey, C. 1988. Identification and conservation of carpet pythons *(Morelia spilota imbricata)* on St Francis Island, South Australia. Herpetofauna. 18(2): 13-20.

Shine, R. 1991. Australian Snakes: a natural history. Reed.

Smith, L.A. 1981. A revision of the python genera Aspidites and Python (Serpentes: Boidae) in Western Australia. Rec. West. Aust. Mus. 9: 211-26.

Storr, G.M., Smith, L.A. and Johnstone, R.E. 1986. Snakes of Western Australia. Western Australian Museum, Perth.

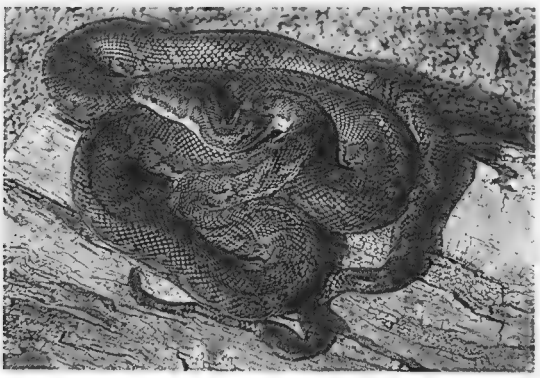

Figure 1.
Morelia spilota imbricata
Darling Range morph
from Mount Helena

THE CONSERVATION AND HUMAN BENEFITS OF KEEPING SNAKES IN CAPTIVITY

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This paper was presented at the One Day Theme held on 29.12.1993 to coincide with the Second World Congress of Herpetology in Adelaide

ABSTRACT

Snakes kept in captivity contribute to our knowledge of those species, especially breeding requirements and behaviour. This activity also results in a more enlightened keeper and this is passed on to others who come into contact with the keeper.

The venoms from poisonous snakes have contributed enormously to medical research and production of drugs and diagnostics.

The very laws that regulate the keeping of snakes act as an impediment to the growth in knowledge of snakes, their conservation and venom research.

INTRODUCTION

The decline in wildlife generally in Australia is a matter of considerable concern. Kennedy (1993) claims that we have lost 20 species in the last 20 years. The ANZECC List of Threatened Vertebrate Fauna (April 1991) recognises 41 vertebrate species and sub-species as extinct and 139 as threatened. Fortunately there are no known snake extinctions however a number of species are showing signs of rapid decline. There is evidence that large dangerous elapids have declined seriously in the last 13 years (Mirtschin *et al* 1993). Herpetologists have noticed that some species are increasingly harder to find and that some species seem to be decreasing in individual size.

IMPORTANCE OF KEEPING SNAKES IN CAPTIVITY

There are many aspects of snake ecology that can be observed by keeping or temporarily retaining snakes in captivity. Typical examples of this type of observation, which have been published are:

Oviposition times: Charles *et al* (1979), Fyfe (1991), Mirtschin (1991).

Clutch size: Wells (1980).

Mating times: Orange (1983), Turner (1985).

Gestation: Mirtschin (1991).

Incubation: Bedford (1992), Fyfe (1992).

Courtship: Fitzgerald (1989), Turner (1992).

Other captive observations in the areas of male combat, seasonal colour variations, polymorphism, defence, social behaviour, prey restraint, and activity have also been published.

These individual observations are like snap shots at any particular time. When they are collated with other individual observations of the same species, meaningful information can be compiled. In some cases these observations are all we know about that species. As scientific study is often limited by funding constraints, the collective contribution of keepers is important.

The other, not so obvious advantage of keeping snakes is the educational value. Clearly, the keeper learns much from his direct experience. We all learn by hearing, seeing and doing. The latter is acknowledged as being the most valuable method of educating. We learn and

remember things better if it is a "hands on" experience. Keeping snakes in captivity also provides the opportunity for others to benefit. Not only does the keeper learn behavioural aspects of the animals, but the many people encountered in normal social relationships may also learn about snakes.

Keeping snakes or any other native animal in captivity could also reduce the number of exotic pets that are kept. The most commonly kept pet in Australia is the cat which is a major environmental problem. Domestic cats kill a total of 80 million native animals per year. Feral cats kill 25 times the number killed by domestic cats and the combined national cull of native animals from cats is about 3.2 billion native animals per year (Mirtschin, 1992). The ratio of cats kept as pets compared with native animals is at least 45:1. Any displacement of cats kept as pets by native animals would reduce the annual cull of native animals and advance community understanding of the problem caused by cats. Hopefully this would promote a political climate that is less emotional and more rational than is currently the case.

USES OF VENOM AND THE SNAKES IN MEDICINE

The keepers of snakes have provided the venom needed for scientific and medical research. This has resulted in a better understanding of physiological systems, new pharmaceuticals and importantly, serums for use against toxic bites.

Ever since 'Stypven', made from Russells viper (*Vipera russelli)* venom, was used to treat patients with haemophilia (Macfarlane, 1961), venom has been used in medicine. Recently a coagulant extracted from the venom of the common brown snake (*Pseudonaja textilis*) together with *Echis carinatus* venom has been developed for improved detection of high levels of lupus anticoagulants in human blood (Triplett *et al* 1993) which can cause untoward haemostatic problems.

Snake venom has led to the discovery of various neuromuscular systems and their operations (Mebs 1989).

Myasthenia gravis, is a debilitating autoimmune disease which causes weakness and paralysis of muscles. Alpha Bungarotoxin from the many banded krait *(Bungarus multicinctus)* provides a sensitive diagnostic test for this disease (Dawkins *et al* 1979). The Australian dugite *(Pseudonaja affinis)* venom can also be used for this purpose (Kay *et al* 1979).

One of the most impressive discoveries in medicine in recent times has been the research into the venom of the South American snake, the Brazilian viper *(Bothrops jararaca)* (Patchett n.d.). This led to the development of drugs which are important in the therapy of hypertension and congestive heart failure.

The most commonly used technique of making snake bite serums is to actively immunise an animal with high doses of venoms against a particular snake species. Horses, immunised with large doses of respective venoms are used widely around the world to make these antivenoms (Theakston & Warrell 1991). Recently there have been investigations into using a more natural way to combat the problem of envenoming (Fotes-Dias, Dinz & Kochva 1990. Hoffman, Frye & Jacobson 1984. Thurn, Broady & Mirtschin 1993). Nature has already solved these problems for some of those animals in need of protection from snake venoms. The snakes themselves need protection from their own venoms. Those species preying on snakes also require a degree of protection. Snakes and other animals appear to have their own natural defences for this problem. These natural inhibitors from snake blood would appear to offer a wider spectrum serum, although synthesizing them or making them by recombinant techniques will be essential before they can be of general use. The inhibitors in red-bellied black snake *Pseudechis porphyriacus* blood have shown neutralising properties for tiger snake venom (Thurn, Broady & Mirtschin 1993) and inhibitors present in the blood of other Australian snakes have shown neutralising properties for a range of exotic as well as Australian snakes.

The only significant toxins in the venom of death adders *Acanthophis* genus, appear to be postsynaptic neurotoxins which block nerve transmission. Recently it has been shown that potentially, there are substantial benefits in treating patients with anticholinesterases to maintain nerve transmission, in the interim before treatment with antivenoms (Flachsenberger and Mirtschin, 1994). This is of significant benefit in New Guinea where patients can take days to reach hospitals for treatment.

THE PROBLEM CAUSED BY THE LAWS

There are very distinct conservation and scientific opportunities available with keeping snakes in captivity, and it would be expected the wildlife authorities in Australia would actively support the practice. This is hardly the case. In Australia, there are strict laws controlling the taking of native animals from the wild, keeping and transferring them. There are 9 separate government authorities that control these activities directly and there are other government authorities that are indirectly involved. These controls weigh heavily on keepers and are a continual discouragement to keeping snakes and effectively reduce the amount of research carried out.

Strangely most of these laws have been enacted to protect native animals.

In South Australia, often regarded as a more lenient state, the requirements/costs involved in the keeping of snakes compared with keeping non-native cats, are as follows:

Snakes	Cats
Permit to take from the wild.	No permit required to take from the wild.
Permit to keep in captivity.	No permit to keep in captivity.
Permit to transfer to another keeper.	No permit required to transfer.
Random inspections.	No inspections carried out.
Periodic returns.	No returns required.
High purchase costs.	Low purchase costs.
Deterrant fines if requirements not met.	No deterrants.

In the state of Victoria the control goes one step further. Public display of any native animal requires an annual fee of $300, whilst no fee is levied on anyone wanting to display cats.

One of the consequences of this is that in S.A. there are 45 cat keepers to every person licensed to keep native animals (Mirtschin 1992). Given the educational value in learning from experience, the South Australian wildlife authorities have done very little to encourage people to learn about snakes or native animals. South Australia has been labelled the "killer state" for mammals (Warren 1990) in Australia and is lagging behind other states despite having the worst record of extinctions in Australia (Kriven 1990). It has also been claimed that from 1983 to 1993 the number of species either threatened or extinct increased from 43 to 66 (Pearce 1993). It is unfortunate that those visitors to our state during the World Congress will not be able to see the numbers and the range of native species once available. On the positive side though, you should see what you can now, for when you come back again, at the current rate of decline, there will be even less to see.

One of the most unfortunate preoccupations of wildlife authorities in Australia has been with wildlife regulation despite the many protestations in the literature (Anon, 1992; Ehmann & Cogger ,1985; Foster, 1992; Greer,1989; Hoser, 1989; Knowles, Maryan & Browne-Cooper, 1991; Mirtschin, 1993; Mirtschin & Davis, 1982; Mirtschin & Davis, 1992; Rawlinson, 1980; Shine, 1991; Tyler, 1979; Weigel, 1991a; Weigel, 1991b).

By contrast, I have been unable to locate any paper, book or article supporting the current regulative system. As well the wildlife authorities, despite requests, have never been able to produce any published material either. Recently, the 9 Australian wildlife authorities and 1

customs authority admitted that in a 9 year period between 1984 and 1993, in 70 prosecutions, a total of 207 birds, 251 eggs and 498 reptiles (i.e. a total of 956 animals and eggs) were saved from wildlife traffickers (Daw 1993). One feral cat is estimated to kill 800 native animals in one year. So for the price of one bullet, the same savings made by the 9 wildlife authorities and 1 customs authority can nearly by achieved. Two bullets , and you're in front. No assessment has ever been made of the effectiveness, in terms of saving wildlife, of the current system. The evidence above suggests effort in other directions would be more profitable.

Whilst there has been an unprecedented growth in wildlife regulations and policies in the last 25 years that have impacted on the keeping of native animals, there has been almost a mirror image in the numbers of species that have become extinct or threatened. Evidence will be presented later at the World Congress on the loss in snake numbers over recent years and a proposal to use changes in snake populations as a guide to small animal status.

Wildlife authorities must realise that conservation is nothing more than having more or the same numbers of species today that we had yesterday, tomorrow. If Australian wildlife authorities want to have a dramatic effect on reversing the decline of native species, they must understand that **before we can give Australia back to our wildlife, we must first give our wildlife back to Australians.**

REFERENCES

Anon (1992). A case for significant deregulation of keeping and taking reptiles and frogs. *Herpetofauna* 22(1):1-2.

Bedford, G. (1992). Notes on the incubation and hatching of the black whip snake (*Demansia atra*). *Herpetofauna* 22(1):24-25.

Charles, N., Whitaker, P. and Shine, R. (1979). Oviparity and captive breeding in the spotted blacksnake, *Pseudechis guttatus*. (Serpentes; Elapidae). *The Australian Zoologist* 20(2):361-364.

Daw, M. (1993). The Cruel Cargo. *Weekend Magazine. The Advertiser.* Sept 11:9-11.

Dawkins, R.L., Garlepp, M and Kay, P. (1979). The dignostic uses of neurotoxins: the contribution of bungarotoxin to the understanding and management of myasthenia gravis. Pp 49-56 in I.W. Chubb and L.B. Geffen (eds) *Neurotoxins. Fundamental & Clinical advances.* Centre for Neuroscience. Flinders University of South Australia.

Ehmann,H. and Cogger, H. (1985). Australia's Endangered Herpetofauna: A Review of Criteria and Policies. Pp 435-447 in G. Grigg, R. Shine and H. Ehmann (eds) *Biology of Australasian Frogs and Reptiles.* Surrey Beatty & Sons with the Royal Zoological Society of NSW.

Fitzgerald, M. (1989). Captive reproduction in the rough-scaled snake (*Tropidechis carinatus*). *Herpetofauna* 19(1):29.

Flachsenberger, W. and Mirtschin, P.J. (1994) Anticholinesterases as antidotes to envenomation of rats by the death adder (*Acanthophis antarcticus*). *Toxicon.*32(1):35-39.

Foster, R. (1992) ARK 2000 Committee. *South Australian Herpetology Group Inc Newsletter* 76:6.

Fotes-Dias, C.L., Dinz, C.R. and Kochva, E. (1990) Neutralisation by homologous plasma of *Crotalus durissus terrificus* (South American rattlesnake) venom and crotoxin. *Ciencia e Culura Revista da Sociedade Brasileira para o Progresso da Ciencia* 42(7):501-506.

Fyfe, G. (1991) Captive breeding of Mulga snakes (*Pseudechis australis*) from Central Australia. *Herpetofauna* 21(2):36-37.

Fyfe, G. (1992). Reproductive record for *Vermicella annulata snelli. Herpetofauna* 22(2):43.

Greer, A.E. (1989). *The Biology & Evolution of Australian Lizards.* Surrey Beatty & Sons Pty Ltd, Sydney.

Hoffman, G.L., Frye, F.L. and Jacobson, E.R. (1984). Resistance of reptiles to venoms. Pp 693-701 in Pleum,B. (ed) *Poisons of Amphibians and Reptiles.*

Hoser, R.T. (1989). *Australian Reptiles and Frogs.* Pierson & Co.

Kay, P., Garlepp, M. and Dawkins, R.L. (1979). Evidence for human anti-venom antibodies and detection of anti-acetylcholine receptor antibodies using dugite (*Pseudonaja affinis*) venom. Pp 265 in I.W. Chubb and L.B. Geffen (eds) *Neurotoxins. Fundamental & Clinical advances.* Centre for Neuroscience. Flinders University of South Australia.

Kennedy, M. (1993). The Story So Far. The Wilderness Society. *Wildlife Calendar, Wilderness Society. Melbourne.*

Knowles, D., Maryan, B. and Browne-Cooper, R. (1991). The role of the amateur herpetologist in Western Australia. *Herpetofauna* 21(1):1-4.

Kriven, S. (1990). SA "lagging" in preservation of endangered species. *Advertiser* Sept 7:3

Macfarlane, H.G. (1961). The coagulation action of Russells viper. *Brit. J. Haemst.* 7,496.

Mebs, D. (1989). Snake venoms: toolbox of the neurobiologist. *Endevour, New Series* 13(4):157-161.

Mirtschin, P.J. (1990). Captive breeding of the inland taipan *Oxyuranus microlepidotus. Herpetofauna* 20(2):7-10.

Mirtschin, P.J. (1992). Presentation given to the Threatened Species Committee. *Xanthopus* Dec. 144:12-14.

Mirtschin, P.J. (1993). A case for deregulation of the keeping and taking of reptiles. *Herpetofauna* 23(1):1-6.

Mirtschin, P.J. and Davis, R. (1982). *Dangerous Snakes of Australia. An illustrated guide to Australia's most Dangerous Snakes.* Rigby, Adelaide.

Mirtschin, P.J. and Davis, R. (1992). *Snakes of Australia. Dangerous and Harmless.* Hill of Content.

Mirtschin, P.J., Sutherland, S.K., Paton, D and Cann, J. (in prep.) Snake bite in humans and domestic animals can be used as a guide for a decline in snakes and small animals. *Trans Roy Soc. of S.A.*

Orange, P. (1983). Observations on the mating of the Bardick, *Notechis curtus,* in captivity. *Herpetofauna* 15(1):24-25.

Patchett, A.A. (n.d.). The design of Enalapril. Hypertension and the Angiotension System: Therapeutic Approaches, eds A.E. Doyle and A.G. Beam. Raven Press, New York pp155-163.

Pearce, W. (1993). Marsupials "on the brink". *Advertiser.* Oct 31:8

Rawlinson, P.A. (1980). Conservation of Australian Amphibian and Reptile Communities. Pp 127-138 in C.B. Banks and A.A. Martin (eds) *Proc. Melbourne Herp. Symp.* The Zoological Board of Victoria.

Shine, R. (1991). *Australian Snakes: A Natural History.* Reed Books, Sydney.

Theakston, R.D.G. and Warrell, D.A. (1991). Antivenoms: a list of hyperimmune sera currently available for the treatment of envenoming by bites and stings. *Toxicon* 29(12):1419-1470.

Thurn, M.J., Broady, K.W. and Mirtschin, P.J. (1993). Neutralisation of tiger snake (*Notechis scutatus*) venom by serum from other Australian elapids. *Toxicon* 31(7):909-912.

Triplett, D.A., Stocker, K.F., Unger, G. and Barna, L. (1993). Use of snake venoms as a diagnostic test for L.A. *Thromb. Haem.* 69(2422):1222.

Turner, G. (1985). Captive breeding of *Unechis flagellum. Herpetofauna* 16(2):53-54.

Turner, G. (1992). Courtship behaviour and male combat in the little whip snake *Rhinoplocephalus flagellum* (Elapidae). *Herpetofauna* 22(1):14-21.

Tyler, M. (1979). The Impact of European man upon Australasian Amphibians. Pp 177-184 in M. Tyler (ed) *The Status of Endangered Australian Wildlife. Proc. of Centenary Symp.* Roy. Zool. Soc. of SA, Adelaide.

Warren, M. (1990). SA- "a killer State" for mammals. *Advertiser.* Oct 31:2.

Weigel, J. (1991a). Maintenance and Breeding of Australian elapid snakes. *Proc. of 15th International Symp. of Herp. Seattle USA.*

Weigel, J. (1991b). Reptiles and the law in Australia: How Protective Wildlife Legislation Can Impede Herpetology. *Proc. of 15th International Symp. of Herp. Seattle USA.*

Wells, R. (1980). Eggs and young of *Pseudonaja textilis textilis. Herpetofauna* 12(1):30-32.

Request for Information on Reproductive Behaviour in Pythons

Professor Rick Shine is carrying out a research project on reproductive behaviour in snakes, especially pythons. He would like to hear from anyone who has observed either male combat behaviour (wrestling, biting, etc.), or the absence of such behaviour (e.g. large groups of adult pythons found together during the mating season) in either the field or in captivity. He is particularly interested in diamond and carpet snakes *(Morelia spilota)* but information on any snakes would be of interest. He would like any details on the date, the place, the nature of the behaviour, and so forth, to be sent to: Professor Rick Shine, Zoology A08, The University of Sydney, NSW 2006 - or phone Rick on (02) 692 3772. Any information used in the research will be fully acknowledged.

RECENT RECORDS OF THE BROAD-PALMED FROG *LITORIA LATOPALMATA* IN THE ACT: A SOUTHERLY EXTENSION OF THE KNOWN RANGE OF THE SPECIES IN SOUTH-EASTERN AUSTRALIA

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Litoria latopalmata is a terrestrial hylid with a wide distribution in eastern Australia. The species has been recorded from the coast, ranges and interior of eastern Australia, from central Queensland to central New South Wales (Cogger 1992). Up until 1985, the southern-most available records of the species were from Maldon near Appin in NSW (Australian Museum R 79520) and from near Cobbity in NSW (Australian Museum R 107987, R 112935, R 112936). These locations are approximately 200 km north east of the ACT. We have also observed the species near Tuena NSW about 10 km south of the Abercrombie River (approximately 140 km north of the ACT), and at East Kurrajong NSW (250 km north-east of the ACT).

The species was first recorded in the ACT in October 1985, when one individual was located at a farm dam on the "Winslade" property on the Cotter Road, approximately 1.5 km south-east of the Murrumbidgee River. This individual was subsequently lodged in the Australian National Wildlife Collection (A1615). At the time it was suspected to have been an accidental import into the area. However, a second record of the species in the ACT was obtained in July 1991, when a single specimen was found under a stone about ten metres from the edge of Stony Creek. This location was approximately 3.6 km north-east of the first site.

During a survey of the vertebrate fauna of the Stony Creek Nature Reserve in the summer of 1992/93 several additional sites supporting the species were found (Rauhala 1993). Substantial breeding populations were recorded at Stony Creek and another creek system known as Block 13, on the west bank of the Murrumbidgee River. Males were also heard calling on both the east and west banks of the river near Casuarina Sands, and from a farm dam at the top of the Stony Creek catchment on Uriarra Road.

Litoria latopalmata in this region is now known from the Murrumbidgee River just north of the ACT border near Wallaroo Road, from the north of the ACT at the Molonglo and Murrumbidgee River confluence (S. Jones pers. comm.), several sites in the Stony Creek Nature Reserve and adjacent farm dams, as well as a rocky section of the main river immediately north of Kambah Pool, and at Pine Island (D. Roso pers. comm.)(Table 1). Recent surveys of the Murrumbidgee River south of Pine Island, and particularly south of Tharwa in the Gigerline Nature Reserve (Rauhala in prep.) have failed to locate further populations of this species, and it is possible that it does not extend much further south than the Pine Island area. Other extensive surveys by the ACT Parks and Conservation Service elsewhere in the ACT over the last ten years have not recorded the species.

Both males and females were located at Stony Creek in December 1992, and three individuals of each sex were measured. Snout-vent length (SVL) ranged from 30 mm to 39 mm in females and from 34 mm to 36 mm in males. Males appeared to utilise solid rock bars and rock slabs

within or adjacent to streams as calling sites. Rocky sections of the stream supported stronger choruses (up to ten frogs calling), with scattered individuals in other sections. Males were often observed calling from depressions and hollows on these rocky surfaces, as well as from slight depressions in adjacent grassland. At Kambah Pool the frogs were found to be calling from depressions and crevices on warm rock slabs immediately adjacent to the river. Frogs heard at the farm dam were calling from partially hidden positions in sedges and grasses within a metre of the pond edge.

Table 1. Records of *Litoria latopalmata* in and near the ACT. Grid references were obtained from the Umburra, Cotter Dam and Canberra 1 : 25 000 map sheets

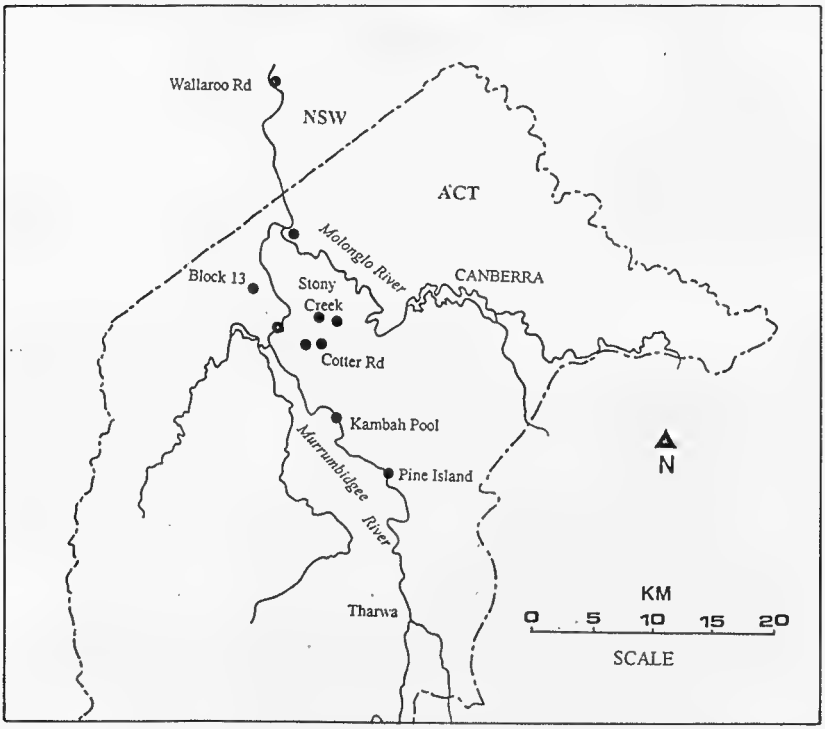
Date	Location	Grid Ref.	Habitat	Altitude (m)	Distance from River	How Detected	No.
Oct 85	"Winslade"	781887	Dam	590	1.4 km	Observed	1
Feb 91	Wallaroo Rd	777113	River	390	At River	Call	2
Jul 91	Stony Creek	802917	Near Crk	530	1.3 km	Under stone	1
Oct 92	Block 13	772928	Near Crk	480	0.5 km	Observed	1
Dec 92	Uriarra Rd	822917	Dam	580	3.2 km	Call & obs.	5 to 10
Dec 92	Uriarra Rd	822917	Dam	580	3.2 km	Call	15 to 20
Dec 92	Stony Creek	805915	Creek	540	1.3 km	Call & obs.	25 to 40
Dec 92	Cotter Rd	810877	QuarryPit	600	2 km	Call	1 to 2
Dec 92	Block 13	772928	Creek	480	0.5 km	Call & obs.	15 to 20
Jan 93	Casuarina S.	782898	River	460	At River	Call	5 to 10
Jan 93	Kambah Pool	829814	River	550	At River	Call & obs.	5 to 10
Jan 93	Uriarra Rd	822917	Dam	580	3.2 km	Call	Several
Mar 93	Stony Creek	805915	Creek	540	1.3 km	Observed	12
Dec 93	Pine Island	873769	River	550	At River	Call	2 to 5
Mar 94	Molonglo	792978	Near Crk	470	0.4 km	Under stone	1

Strong choruses were heard throughout December and January, and although the onset of calling was not specifically monitored, it was noted that the species was not calling in late October. Metamorphs, averaging about 20 mm (SVL) were observed in mid March at Stony Creek, at which time no tadpoles or adults were seen or heard. This indicates that the calling season in the ACT probably extends from about November to January and that larval development in the field takes no longer than about 8 to 12 weeks.

Litoria latopalmata in the ACT appears to be strongly associated with the Murrumbidgee River (Figure 1), being restricted to suitable sections along the river and its major tributary creeks and through these into some nearby farm dams. It is interesting to consider why this species had not been located in the ACT prior to 1985, despite an active interest in herpetology by people living in the ACT. One explanation may be that these relatively inaccessible breeding sites were never visited or surveyed in the breeding season of this frog, which appears to begin much later than most other ACT frogs (Hone et al 1992). It is also possible that this species is extending its range in this region.

The discovery of breeding populations of *L.latopalmata* well south of its previously known range is of interest. Although it is not clear if the species has always been in the region, or whether it has recently expanded its range into the ACT, the finding reinforces the importance of ongoing monitoring of amphibian populations.

Figure 1. Locations of *L.latopalmata* records in and near the ACT.



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REFERENCES

Cogger, H.G. (1992). Reptiles and Amphibians of Australia (5th ed.). Reed: Chatswood, NSW.

Hone, J., Williams, D., Osborne, W., Georges, A. and Stoutjesdijk, R. (1992). Wildlife survey techniques for ecological assessment. A report commissioned by the ACT Planning Authority, Canberra, Planning Brief 91/27.

Rauhala, M.A. (1993). The reptile, amphibian and mammal fauna of the Stony Creek Nature Reserve, Australian Capital Territory. Technical Report 6, ACT Parks and Conservation Service.

Rauhala, M.A. (in prep). The reptile, amphibian and mammal fauna of the Gigerline Nature Reserve, Australian Capital Territory. Technical Report, ACT Parks and Conservation Service.

HERPETOLOGICAL EXPERIENCES AND OPPORTUNITIES AT BOWMAN PARK - A REGIONAL WILDLIFE PARK

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This paper was presented at the One Day Theme held on 29.12.1993 to coincide with the Second World Congress of Herpetology in Adelaide.

From August 1991 to October 1993 I was employed as a Reptile Keeper at Bowman Park near Crystal Brook in the mid north of South Australia. During this time I made herpetological observations in ecology, cat predation, mite treatment and opportune field work.

BROWN SNAKE CANNIBALISM

On 29.11.1991, 65 Common Brown snakes *Pseudonaja textilis* were released into Pit 1 at Bowman Park. The captive population varied between 35 and 70 individuals in the observation period. Each pit (area approximately $10m^2$) is constructed of colourbond sheeting, landscaped, provided with two large water ponds and a large thermostatically heated den made of styrocrete and set into the ground. Individual snakes were marked and identifiable by scale clipping.

Between 22.12.1991 and 09.01.1993 twenty seven instances of cannibalism were recorded. Nine snakes were responsible for all 27 incidents. Each of the nine had a minimum total length of 1.2 metres (see Figure 1). In each instance the snake being consumed was smaller than the one consuming it; in one case a 165cm snake was consuming a 150cm snake. Four of the nine cannibalistic snakes were female, the sex of the other five is unknown. I could not determine the sex of the snakes which were being consumed.

Two incidents are worth mentioning.

1. On 10.01.1992 Brown snake No. 103 was removed from the pit after attempting to eat another snake. It was placed in a separate indoor cage until it was re-released into the pit on 09.01.1993. It had readily eaten mice while caged indoors and was in good condition. Just hours after being released it was observed eating another snake and was immediately removed from the pit. This was the first recorded incident of cannibalism since 10.04.1992.
2. On 02.02.1992 a large female Brown snake, No. 48, was removed from the pit at 10.50am and placed in a clear perspex container after having consumed a smaller snake. An hour later at 11.50am the smaller Brown snake (No. 58), was regurgitated alive and apart from being covered in body fluids, was fully alert with no apparent ill effects.

This data can only be recorded in a captive situation and poses many questions.
Was cannibalism caused by overcrowding? If so, why was only one instance of cannibalism recorded after 10.04.1992 and then by a snake which had previously been removed because it was cannibalistic. It must be mentioned that around 10.04.1992 all the snakes which had been identified as cannibalistic had been removed from the pit and housed individually indoors.

Is there a tendency for females to be cannibalistic?
Are these snakes cannibalistic in the wild?
Data recorded in a captive situation can play a major part in answering many of the questions which these observations have raised.

PREDATION BY FERAL CATS

On 10.12.1991 a large 3.5 kilogram female cat was shot on site at Bowman Park. The cat's stomach contents included unidentified species of Delma and Dragon lizards, the remains of

several Robust skinks, *Ctenotus robustus* as well as rabbit and grasshopper remains. I undertook an extensive cat control program in which over forty cats were shot in and around Bowman Park in just under two years. Of the cats destroyed I have records relating to 22. Of these, nine were adults (8 female, 1 male) and thirteen were kittens. Seven of the eight female cats were suckling young. One female cat shot in July 1992 contained the remains of a pigeon, a chop and several grasshoppers. From this and other records I suspect that reptiles are a major part of the diet during the warmer months. During the cooler months because reptiles are then less active, birds and mammals would comprise the major part of the cat's diet in this area. Further research is needed to confirm this. Between February and August 1993 six adult females, five of which were suckling young, and one adult male were shot. Stomach contents of each were predominantly house mice. A mouse plague occurred at that time. All cats shot during this period were in good health and generally in reproductive condition; probably due to the abundance of food. Because the mice have now stabilised to pre-plague numbers, the cat population which has now increased due to good conditions, will prey heavily on the local reptile fauna in the following warm months.

One way to study the effect of an increased feral cat population will be to capture the cats, inspect stomach contents and continue recording this data. The majority of the cats entering Bowman Park were coming from a farming area less than one kilometre south where several cats were abandoned about six years previously. A thriving population of feral cats exists on the property and approximately twenty cats were shot there two weeks ago. Unfortunately no gut content records were taken. Professional staff based in regional wildlife parks can ensure accurate records are kept and important studies such as these can continue.

CONTROL OF SNAKE MITE INFESTATIONS

Mite infestations were a recurrent problem and they were initially treated with the application of Neguvon (as a fine spray) to kill most mites, and Pest strips (placed in the cage) to kill hidden mites. This treatment did not kill mite that hatched after spraying. Display snakes such as the Death adder *Acanthophis antarcticus,* and Red-bellied black snake *Pseudechis porphyriacus* were frequently having to be treated for mite.

After talking with Peter Mirtschin about the problem I used a commercial product, Ivomec (active constituent Ivermectin). Treatment was as follows: one ml Ivomec containing 10mg Ivermectin was prepared as a solution with 19ml propylene glycol to form a concentration of 0.5mg/ml Ivermectin. This solution was injected into the prey body, usually a dead mouse or rat (dosage 0.2 to 0.4mg Ivermectin per kilogram of snake). Thus a snake of 6 kilograms requires a dose of 4.5ml of solution to provide effective treatment. Once the injected prey body is digested Ivermectin enters and circulates through the snake for a limited period of time. The first treatment for all adult display snakes at Bowman Park was conducted on 08.08.1992. Re-infestation was first recorded on 21.12.1992, over 4.5 months after treatment. The second treatment occurred on 24.12.1992 and re-infestation was recorded on 10.05.1993, again approximately 4.5 months after treatment. The third and final treatment was conducted on 15.05.1993.

Before using Ivomec I spent 2-4 hours 3-5 times a week treating mite with Neguvon and Pest strips. Using Ivomec in the prescribed manner was found to be an extremely effective and time saving method of treating mite in a large captive group of reptiles. It took less than seven hours to complete each treatment.

OPPORTUNE HERPETOLOGICAL OBSERVATIONS

Being on site at a regional fauna park provided numerous opportunities for herpetological observations. In June 1993 a preserved juvenile "snake" was brought to me for identification by a local farmer. An ongoing job for a country reptile keeper is educating people about the

differences between legless lizards and snakes, and of the benefits these creatures can provide, especially to farmers. I identified the specimen as an Eastern Scaly-foot, *Pygopus nigriceps schraderi,* and since it was close to the edge of its defined range, sought confirmation from Dr Mark Hutchinson at the South Australian Museum. Mark confirmed my identification and advised that the specimen (found at Redhill, approximately 33°33'S, 138°13'E) was a southern range extension.

In May 1993 I received a phone call to remove a snake from a warehouse near Clare. From the conversation it seemed that the snake was probably a python. Forty minutes later I was holding a carpet python *Morelia spilota variegata* trying to work out where it came from. Subsequently the snake was identified at the South Australian Museum as a carpet python and it is considered to be of local origin, which is very significant. Further field work is needed to confirm if a population exists in the area.

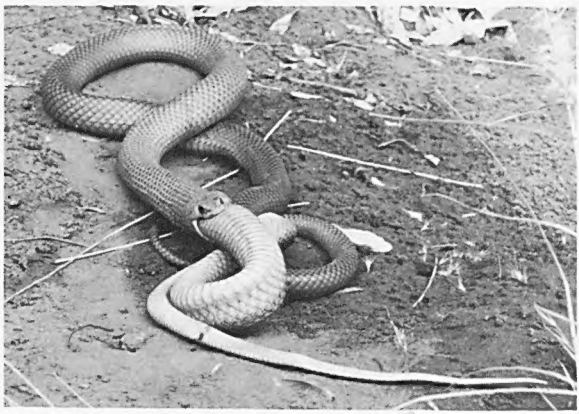
In April 1992 I received a phone call from a person near Wakefield who had a rare albino Sleepy lizard, *Trachydosaurus rugosus.* The juvenile Sleepy lizard was a true albino having pink eyes and a pink tongue. It is generally believed that most albinos are either eaten very early in life because they stand out to predators, or they die from disease. This find was remarkable in that the property had boarding kennels for dogs, and numerous cats wandered about the property unrestrained.

I enjoyed my time at Bowman Park and the many opportunities which it provided. Much of the study work including cannibalism in captive Common Brown snakes *Pseudonaja textilis,* and the local cat control program require further research to be of significant benefit. This research can be continued as long as professional staff skilled in herpetology are based at regional wildlife parks. Without the knowledge and the interest provided by such people many significant opportunities to make new discoveries and to educate the public about the role of reptiles in the environment would be missed.

ACKNOWLEDGEMENTS

Thanks to Peter Mirtschin of Venom Supplies, Tanunda for advising me on the use of Ivomec for mite treatment and to Dr Mark Hutchinson of the SA Museum for assistance in identification of specimens. Thanks also to Harald Ehmann for inviting me to speak at the One Day Theme and providing assistance with the writing of this article.

Figure 1. Common Brown snake in the process of consuming a smaller common Brown snake.



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